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THE FAIR FUND.

An important meeting of the Gas Industry Council was held at the Astor House last Tuesday, and although it was called to order in a spirit of gloom, the adjournment was made in an atmosphere of brightness. While we have not been informed as to the precise action taken, enough was gleaned to more than give an impression that something of importance was agreed on that will lead to good results, in any event. The fund will either speedily be assured or the fraternity will quickly know whether or not the building is to be erected. Speaking for ourselves, and for a goodly number of the subscribers also, we repeat our hope that the Council will decide to go on with the building project on a scale commensurate with the moneys that have already been pledged. No doubt all will assent to this; for it cannot be supposed for a moment that any of the subscribers on the list put down their names in the covert belief that they would never be called upon to pay the subscription because of a failure on the part of the industry at large to contribute a named total amount. In other words, we do not believe that any of the subscribers have their subscriptions fixed on a hook that is attached to a line. The additional amounts pledged up to Wednesday last are very encouraging, and seem to show that the East is really more anxious to have the Fair Fund assured than are the other sections of the country. The Lowell (Mass.) subscription, and also the subscription from Lawrence, Mass., are very liberal ones; and surely if the proposed exhibit is worth—and the proprietors at Lowell and Lawrence are not capitalists who are likely to enter into a money investment without counting carefully the return that it is going to bring—$600 to the gas interests of those two cities, what ought it to be worth to Chicago and other nearby points? A low estimate would be five times that sum in thousands.

The attitude of Chicago is inexplicable, and at the risk of incurring the frowns of the great men in control of the Chicago Company, we can bluntly, but nevertheless truthfully, say that if the gas building is not erected, upon them must rest the blame. New York cannot see its way clear to respond, unless Chicago makes some sign of willingness to assist. Every gas man in the country knows that the World's Fair will be worth at least $250,000, in excess of its regular business, to the Chicago Gas Company; and yet it makes no sign of assent towards assisting the industry at large by offering anything in support of a scheme that, while benefiting the industry at large in a measurable degree would benefit still more its very self. The additional subscriptions, together with the state of the general fund as tabulated up to Wednesday, June 22d, are appended:

June 11.	Jacksonville (Ills.) Gas Lt. and Coke Co	$70 00
" 15.	Henry S. Whipple, Rockford, Ills	5 00
" 15.	East River Gas Lt. Co., Long Island City, N. Y...	100 00
" 16.	Lowell (Mass.) Gas Lt. Co.	400 00
" 17.	Lawrence (Mass.) Gas Co	200 00
		$775 00
	Amount previously published	59,456 28
	Grand total (to June 22)	$60,231 28

TWO IMPORTANT DECISIONS.

Following closely upon the unfortunate truce agreed upon at Cleveland, Ohio, between the authorities and the local Gas Companies as to the selling rate for gas in that city, are two decisions emanating from recognized judicial authority that go to show that gas suppliers are not altogether at the mercy of the wind-making politicians (?) who unfortunately are in the ascendency in the Councils of many of our cities and towns. The first of these is reported from Des Moines, Iowa, where, in February last, the City Council, by means of a hastily rushed-through ordinance, decreed that the Capital City Gas Company should not charge a rate in excess of $1.25 per 1,000 cubic feet for gas sold by it to ordinary consumers—the Company's rates had been $1.70 per 1,000 for an illuminating use of gas, and $1.10 per 1,000 for gas used for fuel and power purposes. The Company declined to carry on a supply of gas under the ordinance, and, in order to make a test case, the Company notified one of its customers—the Des Moines National Bank—that unless it agreed to pay the former, or rather the existing, rate the supply would be cut off. The Bank demurred, and brought suit for an injunction to restrain the Company from removing the meter, and the authorities joined the Bank in the proceedings. This act of the city caused the bringing up of the "validity and reasonableness" of the ordinance, and the subsequent proceedings were brimful of interest to the fraternity. Eminent legal talent conducted the battle and an imposing array of experts shared in the contest. As we printed in the JORUNAL much of this testimony, it is not necessary to here repeat the same, or even to review it, save to say that it was complete and exhaustive. Judge Conrad, whose rulings throughout the case were impartial and luminous, took the matter under advisement, and handed down a brief decision in the case some days ago, promising at a later date to file a complete opinion. Briefly, his Honor says that as the price fixed in the ordinance was "unreasonably low," the ordinance is, therefore, invalid. He, however, does not decide, in so many words, whether the Council has the power to modify the terms of the existing contract, but from the language of the opinion, which asserts the invalidity of the ordinance, because of the "unreasonableness" of the low price named, one can only infer the Judge to believe that a charge for gas that could be shown to be unreasonably high could be remedied by an ordinance that named a reasonable price. Judge Conrad's opinion-in-full will be looked for with no little interest; and in the meantime the gas proprietors at Des Moines are to be congratulated on the result of their determined and common sense stand for their rights.

The other case is that of the City of Vincennes (Ind.) against the Citizens Gas Light Company, of that city. The proprietors of the latter were, under an agreement with the city, made some years ago, bound by an agreement to supply gas for public purposes at rates that were considered reasonable when the contract was made. The contract was a long term one—we disremember its exact length—but when it was somewhat more than half completed the rates were, in all truth, rather high for the time. The Company voluntarily agreed to reduce the same to a reasonably fair basis, but the authorities, conceiving this to be a confession of weakness on the part of the Company, and in their desire to turn the public lighting over to an electrical clique, arrogantly asserted that the contract would be annulled. They urged several reasons, but depended mainly on the contention that future Councils were not bound by the acts of their predecessors. A long and tedious legal contest was the result, which finally terminated in the complete route of the authorities, through a decision rendered a few days ago. A syllabus of the opinion of the Court will be found on page 929 of our current issue. These decisions are well worth the attention of the industry, and go to show that even gas companies can count upon justice—in some States at any rate.

NOTES.—Mr. Malcolm S. Greenough will be tendered a complimentary banquet at "The Brunswick," Boston, on the afternoon of next Thursday. The hosts will be his immediate friends and associates in the gas industry of the city, where his honorable career for many years is as an open book to the fraternity at large. Mr. Greenough takes charge of the Cleveland Company on July 1st. Mr. W. A. Wood is Chairman of the Committee having the banquet in charge.——It gives us satisfaction to be able to say that Mr. George Shepard Page's Sons have been appointed sole agents in this country for the sale of the Walker Tar and Carbonic Acid Extractor.——We are in receipt of a paper weight in glass mailed to us from Connersville, Ind., at the instance of the Messrs. P. H. & F. M. Roots Company. Any sheets on which it is laid will be virtually nailed to the desk.

[OFFICIAL REPORT—REVISED BY THE SECRETARY—CONCLUDED FROM PAGE 891.]

FIFTEENTH ANNUAL MEETING OF THE WESTERN GAS ASSOCIATION.

HELD AT DETROIT, MICH., MAY 18, 19 AND 20, 1892.

SECOND DAY—AFTERNOON SESSION.

IN THE MATTER OF STANDARD CASTINGS.

The President—The Committee on President's Address recommends that the Association ratify at this time the standard of dimensions for special castings, which has been prepared by the Society of Gas Lighting. I will ask Mr. Slater to explain to the Association the vast amount of labor and expense incurred by the Society of Gas Lighting in getting up these plans, so that the matter may be put in its proper light.

Mr. Slater—The Chairman of that Committee, Mr. Strecker, is not present with us to-day. He has done a large portion of the work, which included much correspondence with most of the foundries throughout the country. I think the majority of them, in fact, nearly all of them, have agreed to conform to this matter, and I think it is generally understood and agreed to by the gas companies. Mr. Strecker has been at considerable trouble and has spent considerable time in this matter. He has given a great deal of attention to it, and we think we have about the right thing for general use, and that the gas companies will find it will benefit them. We think they can adopt these patterns to advantage, and it will be a decided improvement in every respect in making contracts with any foundry. Everything will be uniform, and it will be a great deal better.

The President—We have here a copy that has been prepared, and it seems only necessary to say to the Association that the Society of Gas Lighting spent some two years in getting up these dimensions, and it would seem that they were as good as could be prepared. I myself have had a copy in my office for several months, and have been through it very carefully. This spring I handed it to the Addyston Pipe and Steel Company, asking them if they were willing to prepare a lot of patterns of these dimensions. They said they would be very glad to do so, and wanted to take it up at that time. I thought at that time that it had not been adopted by the Society of Gas Lighting and the other Associations, and it would be better for them, perhaps, to wait and see whether there would be any further changes made in it; so I advised them to wait until next year.

Mr. Slater—I presume nearly all of the gentlemen present are familiar with these drawings and specifications, as they have been all published in the AMERICAN GAS LIGHT JOURNAL.*

The President—I think what has been said is sufficient to show you that the plans as proposed are as good as can be gotten. What is your pleasure?

Mr. Somerville—What steps have been taken, or have any steps been taken to bring the matter before the iron founders from whom we purchase our pipe? If the Association should adopt this as the standard, had not something better be done about that—some committee appointed; or the Secretary, perhaps, instructed to notify the founders to that effect?

Mr. Ramsdell—I took it for granted that the Society of Gas Lighting would take charge of that work. All of the Associations are adopting the same standards, and it seems to me that one Society or one Association could do that work better than to have each of us do it. I would suggest that the Secretary of this Association make known to the Secretary of the Society of Gas Lighting whatever action we may take to-day.

The President—I think that is sufficient.

On motion of Mr. Ramsdell the plans, as proposed, were adopted by the Association.

The President—The next business we have is the paper, by Mr. Fred. Bredel, of Milwaukee, Wis., entitled

THE ADVANTAGES OF RECUPERATIVE FURNACES IN THE UTILIZATION OF HEAT.

To determine the advantages of generating furnaces, more properly recuperative furnaces (such as convert the solid fuel, first, into generator gas, and then burn the same to CO_2 and H_2O, by means of a secondary air supply, previously heated by means of a recuperator), let us consider all the advantages separately:

First.—The saving of fuel.

Second.—The saving in labor.

* See JOURNAL, April 25, 1892, p. 595.

Third.—The saving in floor space per 1,000 feet of gas made.

Fourth.—The greater production per retort before same needs replacing; or, in other words, the saving in wear and tear.

The disadvantages are: The greater first cost.

I. SAVING OF FUEL.—For the analytical calculation of the saving of fuel, I will have to use the metric system throughout, but will give at all times the total result in pounds, cubic feet and British heat units.

To determine the amount of fuel saved for a certain amount of gas made, let us first understand the process under which the fuel is consumed by both ways of heating retorts. In the ordinary way of free fire the solid carbon contained in the coke is burned immediately to CO_2, and forms thereby 1 weight unit carbon, 3.66627 weight units CO_2. In generating firing, the carbon is first burned to CO_2, then, by passing through a layer of hot coke, it is reduced to CO, and then burned to CO_2, by a secondary air supply previously heated, and forms the same amount, or 3.66627 weight units CO_2, and gives the same amount of heat as it would give if it were burned directly to CO_2. In the calculation I have taken the exact atom weights, being 11.97 for carbon and 15.96 for O. In the free fire furnace the process is: One kg. of carbon burned to 3.66627 kg. CO_2 develops 8,080 calories. In the generator firing the process is as follows:

	Calories.
⅓ kg. C is burned to 1.833135 kg. CO_2, giving.....	4,040
This CO_2, by passing through a layer of hot coke, is reduced to 2.333135 kg. CO, by taking up ⅓ kg. C. To make this reduction 2,846.5 cal. are absorbed. We have, therefore, to subtract this amount absorbed	2,846.5
Therefore, heat left	1,193.5
Add to this the heat formed by ⅓ kg. C to CO.....	1,193.5
To this add the heat formed by burning 2.333135 kg. CO to CO_2, equal to 2,440 cal. per kg., or.....	5,693
Or total heat developed.....	8,080

Or, expressed in British measurement, 1 pound carbon gives in either case, 3.66627 pounds CO_2 and develops 14,544 British heat units. This shows that the heat produced is the same if C is burned direct to CO_2, or first to CO_2, then reduced to CO, and burned again to CO_2.

With free fire furnaces the combustion is generally very imperfect, and quite an amount of heat is lost by sending CO to the chimney; furthermore, a great deal of water is evaporated and sent as hot steam into the chimney—another loss.

The waste gases of a free fire bench leave the bench generally at a temperature of 1,000° C., or about 1,850° F., while with a good recuperative furnace the temperature of the waste gases ought not to be higher than 350 to 360° C., or about 650 to 680° F. (See paper * read by me before Ohio Association.)

Let us now figure out the amount of heat lost by burning the coke on an ordinary grate. To do this we must first know the composition of the waste gases. Assuming, as is generally done, the furnaces are fired every hour, the average composition of the waste gases of a well worked bench will be as follows:

CO.....	1 per cent.
CO_2	11 "
O.....	8 "
N.....	80 "
Total.....	100 per cent.

One kg. carbon forms 1.8533 cubic meters CO or CO_2, and we have:

1 per cent. CO = 1 × 1.8533 ÷ 12 = 0.1544 cubic meters CO.
11 per cent. CO_2 = 11 × 1.8533 ÷ 12 = 1.6989 cubic meters CO_2.
8 per cent. O = 8 × 1.8533 ÷ 12 = 1.2355 cubic meters O.
80 per cent. N = 80 × 1.8533 ÷ 12 = 12.3553 cubic meters N.

Or, expressed in weight:

CO 0.1544 × 1.2555 (spec. w.) = 0.1938 kg. CO.
CO_2 1.6989 × 1.9781 " " = 3.3606 kg. CO_2.
O 1.2355 × 1.4304 " " = 1.7673 kg. O.
N 12.3553 × 1.2567 " " = 15.5269 kg. N.

To find the heat carried away we have to multiply above weights by the specific heat of the gases, and the difference between the temperatures at which the gases leave the furnace and the air enters the grate, or 1,000° — 20° = 980° C. To this we have to add the heat carried away by about 0.250 kg. steam, this being about the amount of water evaporated in the ash-pan, and also to add the amount of heat lost by incomplete combustion. The cooling off of retorts by opening the fire door we will consider later.

	Kg.		Specific Heat from 0 to 1,000° C.		Temperature 1,000 —20° C.		Calories.
CO.....	0.1938	×	0.2450	×	980	=	46.54
CO_2	3.3606	×	0.2940	×	980	=	968.25
O.....	1.7673	×	0.2175	×	980	=	376.69
N.....	15.5269	×	0.2438	×	980	=	3,709.75
H_2O.....	0.2500	×	0.6790	×	980	=	166.36
Total.....	21.0986						
Heat carried away.....							5,267.59
Loss of 0.1938 kg. CO is 472.87 — 249.57.							223.30
							5,490.89
The loss by opening the fire door can be safely figured at 5 per cent., but in the general run it is much more. 5 per cent. of the above 5490.89 cal. added.....							263.34
Total loss.....							5,754.23
Or round.....							5,750
The total heat developed was.....							8,080
or a loss of 71.2 per cent.							

Loss of Heat in Recuperative Furnaces.—By an average of 10 analyses I found the waste gases to contain as follows:

CO_2.....	17.92 per cent.
CO.....	0.08 per cent.
O.....	2.17 per cent.
N.....	79.83 per cent.
	100.00

The average temperature of waste gases before entering the chimney flues was 360° C. The amount of waste gases formed by one kg. carbon was as follows:

17.92 per cent. CO_2: 17.92 × 1.8533 ÷ 18 = 1.8451 cubic meters.
0.08 " " CO: 0.08 × 1.8533 ÷ 18 = 0.0082 " "
2.17 " " O: 2.17 × 1.8533 ÷ 18 = 0.2234 " "
79.83 " " N: 79.83 × 1.8533 ÷ 18 = 8.2194 " "

Or, by weight:

CO_2 1.8451 cubic meters: × 1.9781 = 3.6498 kg. CO_2.
CO 0.0082 " " : × 1.2555 = 0.0103 kg. CO.
O 0.2234 " " : × 1.4304 = 0.3196 kg. O.
N 8.2194 " " : × 1.2567 = 10.3293 kg. N.

To find the heat carried away we have to multiply specific heat of gases at 360° by difference in temperature (360 — 20), 340°, and add the heat carried away by steam formed from 2 H and O. The amount of water used under grate is 30 per cent., or 0.3 kg. per kg. of carbon, and we have as follows: (See paper read by me before the Ohio Association.)

	Kg.		Spec. Heat at 360° C.		Difference in Temp.		Calories.
CO_2 equals.....	3.6498	×	0.2340	×	340	=	290.38
CO equals.....	0.0103	×	0.2450	×	340	=	0.86
O equals.....	0.3196	×	0.2175	×	340	=	23.63
N equals.....	10.3293	×	0.2438	×	340	=	856.21
H_2O equals.....	0.3000	×	0.525	×	340	=	5.36
	14.6090						1,176.44
Plus loss on 0.0103 kg. unconsumed CO							12.13
							1,188.57
Plus loss of heat by opening filling door, less 5 per cent.....							51.43
Total loss.....							1,240.00
The heat gained by firing hot coke, coke being used direct from retorts at about 750° C., or about 1,400° F., specific heat of coke being 0.2031.....							150.00
The total loss, therefore,.....							1,090.00
or 13.5 per cent.							

Or, expressed in British measurement, the total heat lost by waste gases is for: Free fire benches, 10,350 British heat units, or 71.2 per cent.; recuperative benches, 1,962 British heat units, or 13.5 per cent. This would be the correct percentage of loss providing all the heat was directly used to heat retorts, but with the recuperative furnaces part is used to superheat the primary and secondary air supply; and there is at all times a loss by radiation and leakage, etc., amounting to about 500

* See JOURNAL, April 18, 1892, p. 558.

cal., and the actual loss is, therefore, about 20 per cent. for recuperative furnaces.

We will now make a calculation of the flame temperature and of the absolute pyrometric efficiency of the different furnaces. The flame temperature for the recuperative furnace will appear high, but it must be remembered that this temperature is obtained only at a certain point and distance above the point of the uniting of CO and O, and will be immediately absorbed and lowered beyond that point.

The Pyrometric Efficiency and Flame Temperature.—To find the flame temperature of combustion, divide the total heat developed by the amount of waste gases multiplied by specific heat. We have therefore:

First, for free fire furnaces—

$$\frac{8{,}080 - 223}{0.1938 \times 0.245 + 3.3606 \times 0.3305 + 1.7673 \times 0.2175 + 15.5269 \times 0.2438 + 0.25 \times 0.7735}$$

equals

$$\frac{7{,}857}{0.04748 + 1.11068 + 0.38439 + 3.78546 + 0.19337}$$

equals

$$\frac{7{,}857}{5.52138} = 1{,}422^\circ \text{ C.} = 2{,}690^\circ \text{ F.}$$

Second, for recuperative furnaces—

The total amount of heat developed by 1 kg. carbon burned to CO_2	8,080 cal.	
Minus loss by opening firing door	.52	
Minus loss for unconsumed CO	.12—	64 "
		8,016 cal.
Plus heat gained by firing hot coke		150 "
Plus heat absorbed by primary and secondary air in recuperator and returned to combustion		2,268 "
Total		10,434 "

And we have:

$$\frac{10{,}434}{3.6498 \times 0.398 + 0.0103 \times 0.245 + 0.3196 \times 0.2175 + 10.3293 \times 0.2438 + 0.3 \times 0.9545}$$

equals

$$\frac{10{,}434}{1.45262 + 0.00252 + 0.06951 + 2.51828 + 0.28635}$$

equals

$$\frac{10{,}434}{4.32928} = 2{,}410^\circ \text{ C.} = 4{,}370^\circ \text{ F.}$$

If primary and secondary air were not superheated we would have, total amount of heat developed 8,166 cal., and 14.6090 kg. products of combustion, and average specific heat of 0.28749 and flame temperature, therefore,

$$\frac{8{,}166}{14.609 \times 0.28749} = 1{,}950^\circ \text{ C.} = 3{,}540^\circ \text{ F.}$$

The total amount of heat developed by 1 kg. carbon is as follows: Free fire benches, 7,857 cal.; generative benches, 8,166 cal.; recuperative benches, 10,434 cal.

To find out the heat utilized to heat the retorts we have to figure out the amount of heat the gases contain when their temperature drops to 1,000° C.

This is for free fire bences, as shown before, 5,531 cal.

For recuperative and generative benches in both cases, $14.609 \times 0.28749 \times 980 = 4{,}115$ cal. And we have:

	Open Grate.	Generative Furnace.	Recuperative Furnace
Total heat at disposition	7,857 cal.	8,166 cal.	10,434 cal.
Heat carried by gases at 1,000	5,531 "	4,115 "	4,115 "
Heat available for heating retorts	2,326 cal.	4,051 cal.	6,319 cal.
Total amount heat in 1 kg. carbon	8,080 "	8,080 "	8,080 "
Or an efficiency of	28.78 p. c.	50.13 p. c.	78.20 p. c.

Or, putting the consumption of coke of a recuperative bench at 100 pounds, the benches would use as follows: Recuperative bench, 100 pounds; generative bench, 156 pounds; free fire bench, 272 pounds.

The foregoing calculation shows plainly the great advantage gained by thoroughly superheating the primary and secondary air supply (principally the latter). I have a table prepared showing the amount of heat transmitted per 10 square feet of fire brick wall, providing the air has a good access to the heated surfaces and takes the heat as fast as it is transmitted.

This diagram (p. 921) shows the nearly absolute necessity of having thin division walls between waste gases and air, and a large heating surface. Furthermore, it is best to change the direction of air very frequently, as is done, for instance, in the Klœnne recuperator; otherwise the heat by radiation will be the only heat completely utilized, while the heat by contact will be utilized only to a small extent.

The amount of heat lost by radiation for a bench of 9 retorts, working 10 or more benches in a stack, is per hour, 31,000 cal., equal to about 123,000 Britsh heat units.

The amount of heat lost by two benches of 6's, free fire, is 32,500 cal., equal to about 129,000 British heat units.

The production of gas per 24 hours is the same:

9 retorts at 10,000 feet = 90,000 feet per diem.
12 retorts at 7,500 feet = 90,000 feet per diem.

So we find that the loss by radiation does not differ much in either case.

By actual experiments I have found that 100 pounds of Youghiogheny coal, distilled in benches of 9's, use 10.5 pounds of hot coke and make a little over 5 feet of gas; or 90,000 feet require 18,000 pounds of coal, and this requires 1,890 pounds of coke, providing the benches are worked right. This 1,890 pounds of coke contain, on an average, 1,757 pounds of carbon. Of this amount about 57 pounds are thrown away with the clinkers, and we have left 1,700 pounds of carbon.

As we have seen in recuperative furnaces, the total heat utilized is 78.23 per cent. of the theoretical 14,544 heat units, or 11,378 heat units, or 1,700 pounds of carbon

develop..... 193,423,000 heat units. Of this are
lost by radiation 3,352,000 heat units.

190,071,000 heat units used to distill 18,000 pounds coal and heat the resulting gas and coke.

If we should use all the heat contained in the coke we would only have to use:

190,071,000 divided by 14,544, equals 1,307 pounds carbon.
Minus 57 pounds carbon wasted in ashes and clinkers..... 57 pounds carbon.

Or..... 1,250 pounds carbon.
Or coke containing 93 per cent. carbon 1,344 pounds coke.

The ideal bench, where there is no loss by radiation or of carbon in ashes nor by waste heat, is the bench that could distill 100 pounds coal by 1,344 divided by 18 equals 7.47 pounds coke.

	Pounds.
In the best recuperative benches to date are used	10.5
In the generating benches without recuperation the consumption amounts to 10.5 × 1.56	16.38
In free fire benches the consumption is 10.5 × 2.72	28.56

Or the net efficiency for different ways of firing expressed in per cent.:

Recuperative	71.14 per cent.
Generating	45.60 "
Free fire	26.15 "

The foregoing clearly shows that what is wanted is high flame temperature. If we compare CO and H, we find:

1 weight unit CO requires 2.4645 weight units air and forms.... 1.5714 weight units CO_2.
Plus..... 1.8931 " N.

Specific heat CO_2 at 2,200° C., or 4,000° F., is 0.395. Therefore,

$1.5714 \times 0.395 = 0.6207$
$1.8931 \times 0.244 = 0.4619$

1.0826 specific heat per weight unit;

And as 1 kg. CO develops 2,440 cal. flame temperature $= \frac{2{,}440}{1.0826} =$ ..... 2,250° C.

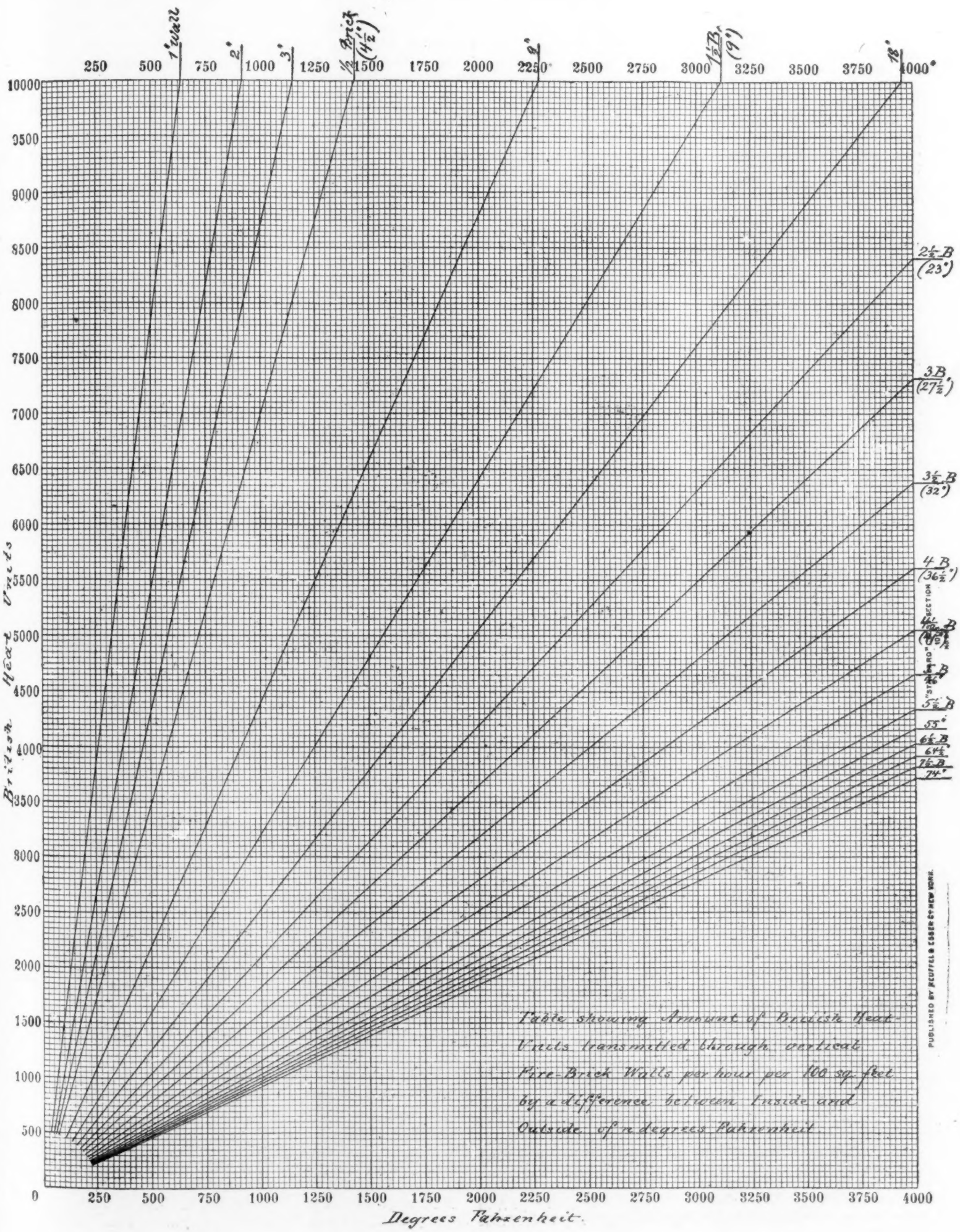
And as 1 lb. CO develops 4,392 heat units flame temperature $= \frac{4{,}392}{1.0826} =$ ..... 4,392° F.

1 weight unit H requires 34.417 weight units air, and forms ..... 8.98 W. U. H.
Plus ..... 26.4371 W. U. N.

Specific heat of H_2O at 1,900° C., or 3,500° F., is 0.885; therefore,

$8.98 \times 0.885 = 7.9473$
$26.4371 \times 0.244 = 6.4506$

14.3979


1" Wall
2"
3"
½ Brick (4½")
9"
1½ B. (9")
18"
2½ B (23")
3B (27½")
3½ B (32")
4 B (36½")
4½ B (41")
5 B (46")
5½ B (55")
6 B (64½")
6½ B (74")
"STANDARD" SECTION
PUBLISHED BY REUSSELL & CASER CO. NEW YORK.
Table showing Amount of British Heat Units transmitted through vertical Fire-Brick Walls per hour per 100 sq. feet by a difference between Inside and Outside of n degrees Fahrenheit
Heat Units per 100 sq. ft.
Degrees Fahrenheit
250 500 750 1000 1250 1500 1750 2000 2250 2500 2750 3000 3250 3500 3750 4000
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000 6500 7000 7500 8000 8500 9000 9500 10000

And as 1 kg. H burned to H_2O (vapor) develops 29,141 cal.

flame temperature $= \frac{29,141}{14.3979} =$ ..... 2,025° C.

Or as 1 lb. H burned to H_2O (vapor) develops 52,454 heat units flame temperature $= \frac{52,454}{14.3979} =$ ..... 3,640° F.

Therefore we must see to it that the generator gases contain as much CO as possible and as little H as possible.

II. The Saving in Labor.—Exact figures on this subject cannot be given, as the amount of gas made per man per 12 hours is vastly different; but it should be about 35,000 to 40,000 feet with recuperative benches, against 25,000 to 30,000 feet with ordinary benches. But at different works and under different conditions this may vary somewhat.

III. The Saving in Floor Space.—A stack of 12 benches of 9's, having a capacity of 1,080,000 feet, or round one million, occupy a floor space 63 × 78 feet = 4,914 sq. feet. = 4.914 sq. feet per 1,000 feet of gas per 24 hours. Twenty-four benches of 6's, with ordinary free fire grate, have the same capacity and require 115 × 63 = 7,245 = 7.245 sq. feet per 1,000 feet gas.

IV. The Saving in Wear and Tear.—The cost of repairing and resetting a bench of 9's recuperative system, or bench of 6's free fire, is about the same per retort; but the retort in the bench of 9's will, on account of even heat and absence of slack, etc., last much longer (or, more exactly speaking, make more gas) than a retort in a free fire bench. By practice I have found out that a good retort in recuperative benches makes on an average from 7 to 9 million feet before replacing becomes necessary, while in a free fire bench a retort averages generally from 4½ to 6 million feet.

Disadvantages.—*The Greater First Cost.*—To consider the first cost of the different benches, we must supply both benches with the same quality of ironwork, such as self-sealing mouthpieces, large mains, etc., and figure the cost per 1,000 feet of gas made per 24 hours, and not per bench.

It will require two benches of 6's to do the same work as one bench of 9's, and we find the cost to be about as 10 is to 9 in favor of free fire benches; but as the difference is so small (only about $5 per 1,000 feet capacity) it is hardly worth while to consider it, although benches might, without self-sealing mouthpieces and in sluggish workmanship, be built cheaper and make the difference about 10 to 8, or up to $9 per 1,000 feet. But it at all times pays in the end to pay a higher price for good benches and good workmanship.

To sum up, on a production of 100,000 feet per 24 hours the saving in fuel in recuperative benches over generative benches is 1,176 lbs. coke, at $3.75 per ton, $2.21; over free fire (open grate) benches is 3,612 lbs. coke, at $3.75 per ton, $6.77. The saving in labor, about 25 per cent., or about $2.50. The saving in wear and tear, 25 cents to 35 cents.

The disadvantages: The greater first cost, at 10 per cent. on first cost, from $\frac{5,000}{365}$ to $\frac{9,000}{365}$, or say that all the benches would work only 200 days per year, $\frac{5,000}{200}$ to $\frac{9,000}{200}$ = 25 to 45 cents per 100,000 feet per 24 hours. Or, expressed per 1,000 feet in cents, recuperative against free fire—

	Gross Gain.	Gross Loss.	Net Gain.
Coke	6.77		
Labor	2.50		
Wear and tear	0.30		
Greater first cost		0.35	
	9.57	0.35	9.22

Plus saving in floor space of 2;331 square feet.

Discussion.

The President—Gentlemen, this paper is before you for discussion, and we will be glad to hear from anyone.

Mr. Egner—I think that very few who have never done this kind of work which Mr. Bredel has gone into so fully, in preparing a paper like this is, can appreciate the amount of labor that it calls for. I think that it is one of the best papers we have ever had before this Association. I have read it over, but I did not see it soon enough to verify any of the figures. I got it just before starting for Detroit, and I am very much pleased with it.

Mr. Dunbar—Mr. Bredel starts out with the statement that recuperative and generating furnaces are the same thing. Then, on page 7, he gives the best recuperative benches to date as using 10.5 pounds of coke per 100 pounds of coal, and in the generating benches, without recuperation, at 16.38 pounds of coke. I would like him to define more clearly what constitutes a generating bench.

Mr. Bredel—A generating bench I consider a bench where the coke is gasified and afterwards burned by the secondary air supply.

Mr. Dunbar—Then you make the distinction as one in which the primary air supply is heated in the recuperative but not in the generative.

Mr. Bredel—A recuperative bench is a generative bench, but a generative bench is not every time a recuperative bench.

Mr. Dunbar—In the generating bench you heat your secondary air supply.

Mr. Bredel—No, sir; not in the generating bench.

Mr. Dunbar—I cannot agree with Mr. Bredel in his conclusions in regard to the superiority of recuperative benches over what he terms the ordinary benches; and I term a generating bench, or half-depth generative bench, in which the secondary air supply is heated, as being under the classification of an ordinary bench. It is in all respects an ordinary bench, in that the only difference in construction is that you build your furnace deeper, and perhaps a little wider and longer, and at a very little additional cost you can put in your secondary air flues, so that in the bench you have one in all respects that is an ordinary bench. With this kind of a bench you can get results approximately as high as Mr. Bredel claims with recuperative benches. It is a bench that in all respects is an excellent one—one that is economical; and the only superiority that I can see in recuperative benches is that the consumption of coke is very much less, and in that respect there is a saving; but a saving in floor space and labor there is not. If we can obtain as much from a retort with a generative bench, then the floor space he has calculated for 24 benches of 6's would be the floor space required for 18 benches, which would reduce the floor space to about that occupied by recuperative benches producing the same amount of gas. Now, about the saving in wear and tear. He says the cost of repairing and resetting a bench of 9's, recuperative system, or bench of 6's, free fire, is about the same per retort. I claim we cannot build a recuperative bench for the same price, or about the same price, that we can a bench with the ordinary fire grate system. In the recuperative bench the complications in the settings of the flues are great and many, and you cannot take out a bench without rebuilding these flues, because the leakage from them would be such as to totally depreciate the efficiency of the bench. A man would not be justified in resetting the retorts without rebuilding his flues. Then he speaks of the greater first cost. He has the greater first cost only 10 per cent. more than the open free fire; but the difference is certainly 100 per cent. It compares just about the same as a two-story house to a one story house. In the first place, the height is twice as great, and the foundations are greater; so that the statement that a bench of recuperative furnaces costs only 10 per cent. more I do not think is correct. I do not think any builder of benches would agree to build a bench at a cost or increase of only 10 per cent. He has figured up at the end a saving of 9.22 cents per 1,000 feet of gas made in the recuperative bench, over generative benches. He can claim no saving except for coke. He has a saving for coke figured out on page 9 at 2.21 cents per 1,000, but at the figures he gave before it was only 1.88 cents. He takes the coke there at 1,176 pounds, but in the table given on page 7 it would only amount to 1,024 pounds, which would reduce that to 1.88 cents. Now, the greater first cost of 0.35 per 1,000 certainly will not be borne out. I do not think any manufacturer of benches would agree to put in a recuperative bench at only 10 per cent. more cost. If in generative benches of 6's the same yield per retort can be obtained, of course his saving in labor of 2.5 cents per 1,000 will not hold good. Then, another thing; in building your retort house you have to build it twice as high, and the increase in expense there is very great.

Mr. Humphreys—We all have to speak in the same language, or we cannot have an intelligent discussion. I would like to have the gentleman who last spoke define what he means by a generative bench.

Mr. Dunbar—What I would term a half-depth generative bench is one in which you have a large furnace, and one in which you utilize a secondary air supply to burn off the remaining carbonic oxide in the gas.

Mr. Humphreys—Is that what you term a generative bench?

Mr. Dunbar—I would term it a half depth generative bench.

Mr. Humphreys—I would like to ask the gentleman if he would not term that a recuperative bench, though of perhaps a somewhat different construction.

Mr. Dunbar—I make this statement, that that kind of a bench is an ordinary bench, and it can be built at a very little increased first cost;

and I mean to be correct in my statement that it is a half-depth generative bench. I deem it an ordinary bench and a good bench.

Mr. Humphreys—He would simply state that in the same way, if all the benches in this country were recuperative benches full depth, they would be ordinary also.

Mr. Dunbar—Mr. Bredel makes a comparison between what he claims to be a recuperative bench and an ordinary bench. I took his idea of what constituted an ordinary bench.

The President—Mr. Bredel made the comparison between a recuperative bench and a free fire bench, but not a comparison with generative benches.

Mr. Thompson—I think Mr. Dunbar misunderstands with reference to the difference between half-depth and full-depth recuperative furnaces. As Mr. Bredel has stated, a recuperative bench is a generative bench, but all generative benches are not recuperative. I take it that Mr. Bredel's understanding of a generative bench would be one in which the secondary air was not superheated, or one with the open hearth system, such as the Siemens system, as used in some of the Scotch works. Am I right, Mr. Bredel?

Mr. Bredel—You are. About the cost, I think I am right. I think I know what I am talking about; and, of course, I would back it up. The cost is per 1,000 feet of gas made, and not per retort or per bench. What difference does it make how many benches are required, if they do the same amount of work—whether 1 of one kind or 10 of another kind? You are not going in to buy, for instance, an engine at so much per volume—an uncertain quantity; you want to know exactly how much work can be done with it, and that is the point I make. I have written this paper from actual experience, and I think I am right.

Mr. Dunbar—I have no doubt but that the gentleman is right, and he has, indeed, written a very valuable paper; but what I object to is his comparing of results capable of being obtained in the recuperative and ordinary benches. The point I am driving at is this: I built a furnace—I do not know exactly what kind of a furnace it is, but I know it has a secondary air supply; it is a bench of 6's; and I get the same results per retort out of these benches of 6's that Mr. Bredel claims he can get out of a bench of 9's, recuperative settings. It does not take any more floor space worth considering to produce the same amount of gas, requires no more labor, and the greater first cost per retort will not begin to amount to the cost of recuperative benches based on an equal production per retort.

Mr. Bredel—You are absolutely wrong there. A bench of 9's occupies a floor space of 12 feet from center to center, and a bench of 6's occupies a floor space of 9 feet 6 inches, and the capacity would be, in comparison, much more per square foot.

Mr. Dunbar—He has the number of square feet for a bench of 9's sufficient to produce 1,080,000 cubic feet of gas at 49,014. With benches of 6's you get the same result per retort. Seven thousand two hundred and forty-five square feet would be reduced one-quarter, which would bring it pown to 5,434—very little more than required for the setting of 9's. In his calculation of floor space required for benches of 9's to produce 1,080,000 cubic feet, and benches of 6's to produce the same amount of gas, the difference is about 2,300 square feet, whereas the difference would be only about 500 square feet.

Mr. Bredel—You are talking all the time about generating benches, and I am talking about free fire benches and recuperative. So there is no use of your talking about generative benches, for we are not talking about the same objects.

The President—Mr. Dunbar, Mr. Bredel is making his comparison between recuperative furnaces and free fire benches. He confines his comparison to that, and he claims that two benches of 6's are equal to one bench of 9's—two benches of 6's with an ordinary free fire are equal to one bench of 9's, recuperative bench.

Mr. Thompson—Perhaps Mr. Dunbar would be satisfied if Mr. Bredel will acknowledge or state that he does assume the half-depth regenerative bench, which Mr. Dunbar has, to be a recuperative bench.

Mr. Bredel—That is what I say—that is what I have been driving at all the time.

The President—We would be glad to hear from some other gentleman. The paper perhaps does not admit of such a discussion as some of the others we have had, but possibly some other gentleman may want to say something.

Mr. Chollar—It seems there is not so much difference between Mr. Dunbar and Mr. Bredel, as Mr. Dunbar would think, because they are both talking about the same kind of a furnace but of different construction. Mr. Bredel has one kind of recuperative furnace in his mind while Mr. Dunbar has another, and Mr. Dunbar only supports what Mr. Bredel has said. One point in that paper pleases me very much. I have worked at it a good deal and Mr. Bredel has solved it in a very nice way. We have been wanting some means of finding out the theoretical quantity of fuel necessary to volatilize coal in the retort, and it seems the simple way always comes last. In the latter part of Mr. Bredel's paper he has figured it out very nicely and in a very simple way.

On motion of Mr. Jenkins a vote of thanks was tendered to Mr. Bredel.

THE QUESTION BOX.

The President—We have several questions here which we would like answered. One is:

"Does it pay to dispense with stopcocks and boxes on service pipes?"

Mr. Lansden—At one time I had charge of three or four small works in growing western towns. The practice of the authorities was to put down plank pavements, and there were no thoroughly established street grades. I had charge of one works for about 2 years in a town the buildings in which were mostly of frame. One night a fire that started burned up about 20 buildings before the fire was extinguished. Our stop-boxes had been put in the wooden pavements, and I undertook, with the men, to turn them off but only succeeded in turning 1 off out of 20. I found I could get quicker and better results by leaving the gas burning as the fire progressed and remove the meter. After that I built several small works in similar towns, and never put in any stop boxes. However, in cities where the pavements and the grades are all right, and where you can keep the tops of the boxes tight—of course the boxes must have tight tops or the boys will fill them with stones—boxes can be used satisfactorily. But my experience in small and growing towns goes to show that boxes are not safeguards. During fires you can save by removing the meters—that is, you can save money by not going to the expense of putting in stopcock boxes, and removing the meters when fires break out. In 2 years I only lost 2 or 3 meters.

Mr. Somerville—I believe in England they do not use such things as stopcocks and boxes. My experience is something like Mr. Lansden's, in the case of a fire.

Mr. Jenkins—We do not use a stopcock or box. We find it best to remove the meters and save them instead of the stopcock.

Mr. Young—I was just going to say that although in a great many instances, when you want to turn off the gas at the stop-box, you cannot do it—the box is either filled up or something of that kind—in the case of a fire, when the firemen find difficulty in putting out the flames, because of the gas burning in the house and relighting the flames again, if you have the stop-boxes in place you show to the community or the insurance company that your intentions were all right. It was not to save money that you could not shut off the gas, and you might save considerable expense in that way. Insurance companies and the proprietor of the property might claim that, if you had exercised proper caution and put the stop-box and stopcock in you might have been able to shut off the gas and there would have been no fire, or very little damage done. On that ground I think it is inadvisable to recommend the gas companies not to put in stopcocks. In some cases they are very convenient. Sometimes when a customer refuses to pay his gas bill, the man you send around to shut of the gas, when the lady of the house discovers what he is after, is met with an axe or something of that kind. He is supposed to go into the cellar; but it is very handy to turn the gas off at the pavement. I do not think we ought to dispense with the stopcock and box at the curbstone.

The President—I would say in my own experience the Company with which I am associated has always been in the habit of using stopcocks and boxes, and we have found, in case of large fires, that it is very useful—in that it saves a great waste of gas. It so happened a short time ago there was a large fire in one of our business blocks on which there did not happen to be a stop-box. There was no possibility of shutting off the gas and so the fire burned out all the gas fixtures and the gas was leaking there for nearly 24 hours before the debris was cleared away so the gas could be shut off. The next question on the list is No. 3:

"In reviving oxide in the off box, without removal of same, is it best to use steam where it will come into contact with the material or blow air through without steam?"

Mr. Thompson—My experience has been with one phase of this question only. We have been for some time reviving our oxide in boxes with steam and air by making an attachment at the inlet pipe to a purifier and blowing a tight jet of steam through there, drawing our air through the outlet pipes. If there was a blackboard here I could by means of a diagram make the point clear. For the off box there is a connection in the center seal between the inlet and outlet pipes. In injecting steam into your inlet pipe you draw the air down through your outlet and we here have a cover with a slide in it by which the quantity

of air entering can be very nicely adjusted, so all danger of setting the oxide on fire is avoided. We have made no experiments with the reviving of oxide by the use of an injector, in which the steam would not come in contact with the oxide, as described, for instance, by Mr. W. A. Wood, before the New England Association last spring; but we hope soon to do so.

Mr. Young—I would judge it depended considerably on the condition of the oxide as to whether it would be advisable to introduce steam along with the air for revivifying—if the oxide is new and the oxidation very rapid; if I were doing it I would introduce enough steam to keep the temperature below the firing point. When the oxide becomes older, and the oxidation not so rapid, I would do away with the steam. You require all the air that you can get in without any counteracting to raise the temperature for oxidation. The solution of the question would depend altogether on the condition of the oxide, as to whether it would be necessary to use steam or not.

Mr. Bredel—When in the San Francisco works I saw an apparatus, devised I believe by Mr. Jones, the Superintendent, for reviving which struck me as being very sensible. In the center of the bottom of the purifying box (the box is 24 feet square, or something like that) he has put a 4-inch pipe. In that 4 inch pipe is a steam jet, on the order of a steam jet exhauster. He lifts off the cover of the box and closes the outlet so that the gas cannot be threshed around, then he puts the steam jet on and draws through about 4 times the amount of air that would be necessary to revivify. He does that to keep the temperature down, and it takes generally from 1 hour to 24 hours to revivify a large box.

Mr. Thompson—That is precisely the one I have reference to as having been described by Mr. Wood. Doubtless Mr. Jones took that idea with him from Boston.

Mr. Bredel—Yes; so he did.

Mr. Lansden—As I understand Mr. Bredel, he says to put as much air through it as possible.

Mr. Bredel—Yes; you have to put enough air through it. If you put through exactly the amount of air required to revivify, the oxide becomes hot.

Mr. Lansden—Several years ago I undertook to revive by the use of a fan. I first made a screen of wire. I used a material which I thought could not burn, and that was broken firebrick, about ½-inch cubes, and iron filings. I tried it in one box and revived that way. I found I could run it up to 500° and clear it entirely of the sulphur. One day, when absent for a few hours from the city, the man who had charge of it—he is one of Mr. Chollar's right-hand men to-day—thought he would beat me a little, but when he attempted to take the temperature in the box he broke his thermometer, letting his fan, however, keep on running. He sent up to the city to get another thermometer, and discovered, some 20 or 30 minutes later, that the box was on fire. He removed the lid and found the iron and firebrick had about all run together. I had to throw it away. I find that the application of a small amount of steam will prevent the heating, and it takes, I think, pretty nearly 300° to drive the sulphur out. To revive it in two or three hours with the immense amount of air required, as Mr. Young says, you have to be very careful about how old your purifying material is.

Mr. Bredel—At the old station of the San Francisco Gas Light Company, the old oxide took more time and care when being revivified—about two hours; but with new oxide at the new works one hour only was needed. The whole thing is to put *enough* air through it to keep it cool. That is the whole secret.

The President—Question No. 4 is:

"After revivifying oxide, why is water thrown on it before replacing it in box?"

Mr. Somerville—I should think, if the oxide is dry, it is possible for the gas to take some of it and carry it in with it. I put water on it to prevent that.

Mr. Chollar—I think Mr. Somerville's idea is that it is put on there to keep it wet.

Mr. Young—I dampen it to assist the chemical action. All chemical action takes place in moisture more quickly than in dry.

The President—Next, we have:

"Can any one give the facts in regard to the Harris process of gas making?"

Mr. Lansden—I received a letter a short time ago telling us that some people were organizing a new gas company, in Cincinnati, to operate under the Harris process, and the letter also stated that the process, as the writer understood, was in full operation in Washington. I had heard of the process having made its appearance in Washington, where they are putting up, as I understand it, a small plant. Certain influential men are backing it. I do not like to have a thing of this kind go on without getting information in regard to it. I understood there were quite a number of men in the Western Association who had visited Maysville, Ky., where a Harris plant is said to be operated. It seems they have organized a company and are selling stock, and as I could not give Gen. Hickenlooper—it was he who wrote the letter—any information, I only wrote back to him that three weeks before I heard from him he had offered $100,000 for a 20-day option on Cincinnati. That was all the information I could give him in regard to the process. I have some of their claims as to what they can do, and I think when these "new discoveries" come up the best way is to get at the experience of men who are practical men. The claims that their prospectus makes are wonderful—cheap as daylight, almost; and I thought if some of the gentlemen who had visited Maysville and watched the process, and who were not interested as newspaper men, etc., would give us some of their experience, we might find out something about it.

The President—Has any gentleman been at Maysville who can give us any information on this process?

Mr. Egner—I have not visited Maysville and have not seen the process at work. I have examined the patents, and there is a great similarity between the Harris process and some others I know of. However, if any gentleman here is contemplating the erection of water gas apparatus, and fears to be taken in with an infringing patent, I would like to call his attention to some of the decisions of the Supreme Court in past patent causes. They are good decisions and definitions and stand, and may aid such as are in doubt to decide upon what to do: "An equivalent in patents is defined as a thing which performs the same function, and performs that function in substantially the same manner as the thing of which it is alleged to be an equivalent." "There are two tests of equivalency. *First*, identity of function. *Second*, substantial identity of way of performing that function." "A change of form does not avoid infringement of a patent. Even when a change of form somewhat modifies the construction, the action or the utility of a patented thing, non-infringement will seldom result from such a thing." "A defendant's machine may be better than that covered by the patent in suit; but if that superiority resulted from some addition to the latter, it will have no tendency to avoid infringement." There are a great many gas companies in the United States to-day who wish that they had not infringed a certain patent that you all know of. There is a possibility that some will have to pay for what they do not look for now, the purchasing patented processes or apparatus; it pays to be careful, and perhaps consult others who have had experience in such matters.

Mr. Lansden—May I read some of the claims of this Harris process?

The President—If you will not take too much time.

Mr. Lansden (reading from pamphlet)—"Ten pounds of coal in this process produce 700 cubic feet of gas. The addition of 2 gallons of crude oil raises this amount to something over 1,000 cubic feet. By doubling this quantity of oil the fuel gas can be carbureted up to any desired candle power, and can, therefore, be used for illuminating as well as heating purposes, thus obviating the necessity of two lines of pipe. A machine 14 feet high and about 16 feet in diameter will gasify 20 pounds of coal a minute, and will have a daily capacity of about 3,000,000 cubic feet of enriched gas. As a result of practical evaporative experiment, corroborated by chemical analysis, the gas possesses from 60 to 80 per cent. of the heating power of natural gas. With coal at $2.50 a ton and crude oil at 80 cents a barrel, gas can be put in the holder for about 5 cents per 1,000 cubic feet." Here is some analysis of the Harris gas, purified: Carbonic acid, 0.2; oxygen, 0.4; heavy hydrocarbon, 9.0; carbon monoxide, 18.9; hydrogen, 10.2; marsh gas, 20.3; nitrogen, 41.0. I have talked with some of the parties interested, and they tell me positively they can make it at 3 to 3½ cents per 1,000, and I want to know if it is a fact. I do not want to be taxing my Company to pay the expense of heavy machinery—and I think if some of the Western men who have visited Maysville will only tell me some of the facts it will save me a great deal of trouble, for I have had 50 letters in the last 4 weeks from the West inquiring about this process that is "running so successfully in Washington."

Mr. Coverdale—I will state that I was in Maysville and saw the Harris works. At the time I was there, or the day before, they had a great many capitalists on hand for the purpose of taking stock in the Company. All the work they were doing was to fit a 25-horse power boiler to raise the steam. I talked to the men about it, and went into the place to see the gas burn, but it would not burn. They had a heating stove with but very little heat in it. I talked with them for probably 3 or 4 hours, and when I left my parting salute was, I hope the next man who comes here will know something about it.

Mr. Humphreys—I want to call attention to the fact that 10 pounds

of coal contains 14,000 heat units. After they have turned it into gas they have either got 420,000 or 520,000 heat units; so it is a very efficient process. (Laughter.)

Mr. Lansden—I would ask Mr. Humphreys to put that in a different way, for the reason that a great many men would take his remark, as he makes it, as a fact.

Mr. Humphreys—Then I will state it in another way. From the coal they put into the furnace they get 4 to 5 times as much heat as the coal possesses. In other words, they have got perpetual motion, which we know is an impossibility.

The President—Mr. Doan has stated that both Mr. Light and his son have at different times been to Maysville, staying, in some instances, two or three days, only to report on their return that the process was of no account. The next question we have is this:

"In using iron oxide for purification, it is found to be charged with naphthaline. How can this be removed?"

Mr. Thompson—Blow steam through it.

The President—Question No. 8 is:

"Are there any successful methods for recovering the iron from the spent oxide?"

Mr. Somerville—It is spent oxide, is it not?

The President—Yes; and the answer is, "No."

Mr. Odiorne—Mr. Douglas, I think, could answer that. I talked with him on the train coming down, and he told me he had seen it tried, and that it was quite successful. Burned it, placing the fire under the vessel.

Mr. Douglas—I heard of one instance where hot coke was taken out in the yard and thrown on the ground and the oxide shoveled on top of it. They claimed they got most of their oxide back in that way, and it worked all right afterward. That is all I know about it.

Mr. Odiorne—I put in about 1,000 pounds in two retorts, opened the stoppers with stand-pipes, and I burned it—leaving it in there until the sulphur had all thoroughly burned off, and I was very glad to stop with that amount of experience.

The President—Question No. 9 is:

"Are gas companies that own and operate electric light plants satisfied with the profits they are making in this line of their business?"

(Cries of "No," from all parts of the room.)

The President—Is there anyone in the room willing to answer this? I think, perhaps, the question is fully answered.

Mr. Humphreys—Are they satisfied with the profits they are making in the gas business?

Mr. Gwynn—As far as we are concerned, we are fairly satisfied with the returns from our plant. While it is not giving us as good returns for the money invested as the gas plant, it is doing very well, possibly better than most plants. I do not know that any of us are satisfied, but this I think is due to the mismanagement and careless construction of a great many of the plants. A great many of them were thrown up in a reckless way by the contractors, causing a big leakage account to be overcome, who used underwriter's line wire, and followed inferior construction practice. The only way to make any money in the electric light business is to equip the plant in the finest way possible, and by so doing cut down the running expenses.

Mr. Doan—I don't like to see this question go by default, and in vindication of the position taken by our late friend, E. J. King, who, in a paper read before this Association some years ago, strongly advocated the union of the gas and electric light interests, I feel it incumbent on me to give a history of our experience. We have been running our plant now, I should think, some 7 or 8 years, and have met so far with fairly good results; have made a good interest (not large) on our investment. There is, however, one trouble with the electric lighting business; you never get through spending money; there is a continual expenditure, which increases the capital invested. We have lately added a power plant to our station, and I think the solution of electric station business is in that direction. There is good money in the motor business, and I think anyone who operates an electric light plant can well afford to equip it for the electric motor. Our plant was formerly equipped with three high-speed engines, but lately we have substituted for them two 240-horse power Corliss engines, and we are securing most excellent results from the change; for with the new steam boiler capacity we are now running more lamps, the electric street railway (6 motor cars, with trailers), and the gas works, where, prior to the substitution of the Corliss engines, we could barely run the lamps alone.

Mr. Dunbar—What price do you obtain for your arc and incandescent lights?

Mr. Doan—The arcs are 1,200 candle power, and we get $8 a month for one, $15 a month for two, and $21 for three. We run, from as soon as it gets dark in the afternoon or evening, until 12 o'clock. The incandescent lamps are metered, and we get 1 cent per ampere hour, with 5 per cent. discount on all bills paid by the 5th of the month.

The President—Question No. 10 is:

"What should be the minimum cost per 1,000 cubic feet for purification of water gas? A factor to be considered is the amount of output, and the charges should include cost of materials—lime, sawdust, shavings or chips, copperas, sal ammoniac, iron filings, borings, etc., freight and hauling of materials, labor of preparing the oxide and lime, and all subsequent labor in both the purifying and revivifying rooms."

Mr. W. L. Brown—That is a question which I sent to the box because I wish to make some comparison with our own practice, and the question was prompted by the very serious factor of the amount of output. There can be no comparison made between those companies that send out 100,000,000 feet and the small companies. I am interested in the small companies and I will give you our own experience. For the year ending May 31, 1890, on an output of 14,485,400 feet, the cost of purification was 1.9 cents. For year ending May 31, 1891, on an output of 16,725,000 cubic feet it was 1 cent and 2 mills. For the year ending May 31, 1892 (last two weeks estimated) on an output of 21,436,000 feet, the cost wast $\frac{6}{10}$ of a cent.

Mr. Humphreys—I would not like to say what the minimum cost is; but I should say $\frac{1}{2}$ to $\frac{3}{4}$ of a cent on an average.

The President—No. 11 is:

"Is it possible to ignite an explosive mixture of gas and air from a lighted pipe or cigar? Is there on record an instance of this kind?"

Mr. Jenkins—Those questions came to me just before I left home to come here, and I asked a young man at our gas works to make a few experiments. I have it here written down and will read to you the result:

Ignition of explosive mixtures—Coal gas and air from 1 in 5 to 1 in 10.

Experiment I. By a flame—Exploded.

Experiment II. By a glowing match, after blowing out the flame—Not exploded.

Experiment III. By a piece of wood $\frac{1}{2}$ inch in section, charred and flame blown out—Not exploded.

Experiment IV. By a spiral of paper, after blowing out flame—Not exploded.

Experiment V. By a single strand of iron wire $\frac{1}{32}$ inch in section at bright red heat—Not exploded.

Experiment VI. By same wire, coiled into a spiral, at bright red—Exploded.

Experiment VII. By a lighted cigar—Not exploded.

Experiment VIII. By same cigar while air was being drawn through it—Not exploded.

Three to four trials were made with each substance, the mixtures ranging from 1 in 5 to 1 in 10. Only one trial was made with the spiral of wire (Experiment VI.) The mixture was 1 in 8 in this experiment.

The apparatus used was simply a wide-mouthed bottle, from which the bottom was removed. The bottle was measured and graduated and set in a trough of water. By altering the height of the water in the trough the pressure could be varied. The bottle was filled with the mixtures, and these were tried by removing the cork and plunging the igniting materials into them. The gases were well agitated to cause intermixture. In experiment VIII. the cigar was held in a rubber tube, and air drawn through it while the mixture was caused to impinge upon it under a slight pressure. In experiment V. the reason, I believe, that a single strand of wire did not produce explosion, was that it lost much of its heat by radiation before it could be brought into contact with the mixture. To produce explosion in a gaseous mixture requires a certain initial temperature, which I believe will be found to vary with the density of the gas. When this temperature is reached combustion will take place, whether flame be present or not. As proved by experiment VI., such metals as iron bear and convey this temperature long before they reach the flaming point. Whether or not carbonaceous substances will cause explosion without flame seems to depend upon their density. As seen by expertments II. and III., light glowing charcoal did not ignite the mixture. I belive, however, that had the charcoal been compact, like that made from oak, it would have caused ignition, and I am certain that an electric light carbon heated to redness would have done so. It would seem, however, that substances having the density of tobacco or paper do not produce combustion, unless in actual flame.

The President—Mr. Ramsdell mentioned to me that he was once up in a balloon with a lighted cigar and that the balloon blew up.

Mr. Ramsdell—The blowing up is not exactly correct. I was filling a balloon at one time, and had about 20,000 feet in it when a storm came up which blew the balloon about considerably and finally tore a rent in one side about 6 feet long. The balloonist thought we could probably repair it and still make the ascension, and after working a good while we gave the scheme up. But before the gas had escaped from the balloon

he asked me if I had ever been in one before. I said, no; and we walked into that balloon staying in there probably a minute. Of course we were entirely surrounded by gas, and did not think of it until I came out of the balloon that I was smoking a cigar while I was in there; but owing to the fact probably that the gas was not in the shape of an explosive mixture it did not explode in that case.

Mr. Miller—I think a good many experiments have been made and show that the explosive mixture necessary is 1 part of gas in 8 of air to 1 part of gas in 16 of air. The reason it did not explode in Mr. Ramsdell's case was because there was too much gas.

Mr. Young—In regard to this question I think we ought to be very careful about what goes into print. We might convey the idea, from our remarks here, to people who did not attend the meeting, that it would be impossible to ignite an explosive mixture from a pipe or cigar. I think we ought to make it very plain that it is a very dangerous experiment to go into a purifying house with a lighted pipe or cigar.

Mr. Somerville—I have seen a workman ignite gas from the spark of his pick. I remember, when quite a young man, when assisting the blacksmith to shrink a band on a 16-inch pipe, we fired the gas. The valve had been shut, but gas remained in the pipe and got mixed with the necessary amount of air. The iron did not show red, but I suppose the tapping of the hammer sent a spark into the mixture, which exploded. The blacksmith, being on the top of the pipe, got a severe burn, while I, being below, escaped with a fright. It is a serious matter, and too great caution cannot be taken to keep away from fire.

The President—No. 13 is:

"What would be an equitable rule for the valuation of ammoniacal liquor from the gas works for seller and purchaser?"

Mr. Young—That, I should think, is subject to variation, according to the demand for ammonia. I do not think you could adopt any rule. Do I understand the question to ask what would be a fair price?

The President—What would be an equitable rule for the valuation?

Mr. Young—That is a different thing.

Mr. Egner—I was connected with a Company not very long ago, when we had a great deal of trouble about that very same thing. We were paid so much per 100 ounces, and the contract specified 100 ounces should mean the amount of ammonia it would take to neutralize 100 ounces of *pure sulphuric acid*. The trouble was to satisfy the contractor as to what was pure sulphuric acid. He was not satisfied with any test at all. The pure sulphuric acid which we bought in the chemical stores, and which was sold as chemically pure, he was not satisfied with. I think it would be well if we could get an expression upon that.

Mr. Brown—It is a matter very easily done. Simply make a standard solution of sulphuric acid, or any other acid.

Mr. Egner—Suppose that the contractor would say, "Well, that is not pure acid." If you read up on this subject you will find that it is a pretty important one, and that, therefore, some rule ought to be established which would be acceptable to seller and purchaser. I would suggest that we might say the purest acid that can be bought. The matter was finally brought before our President [illegible] McMillin, who decided the purest acid that could be bought should be the standard.

Mr. Young—Could not the trouble be avoided in making the contract by saying that the acid which was to be tested was to be so much, Baume hydrometer.

Mr. Egner—Yes, that would do; but it was not satisfactory in our case.

Mr. Bredel—No, that would not do. The amount of SO_3 and H_2SO_4 varies. It is not the same all the time. He might buy in one place and you buy in another, when you get two different kinds of sulphuric acid.

Mr. Young—Still, if it was 66° Baume, that would settle it.

Mr. Bredel—No, it would not. The acid might be 66° B. and yet have different percentages of SO_3 and H_2SO_4. He buys the test acid in one place and you buy it in another place, and whose acid are you going to use? There you would get into a dispute right away. The strength of the acid would not be the same.

The President—No. 14 is:

"What is the best and most equitable way to sell coke—by weight or by measure?"

I suppose there are as many different opinions as there are people.

Mr. Lansden—I would suggest that when we have such weather as we have had in Detroit this week, we had better weigh it.

The President—I find the most satisfactory way to sell it is by weight.

Mr. Young—To the company or the buyer?

The President—Most satisfactory to me. (Laughter.)

Mr. President—No. 15 is:

"By what method, or in what manner, can the ammoniacal liquor of small gas plants be most profitably utilized? By small gas plants is meant those carbonizing from 4,000 to 8,000 tons of coal per annum."

Mr. Egner—I think by concentrating it and getting as good a price as you can. I know one small company doing that now and it will get the price of all its machinery on this account back within 9 months.

The President—I have been asked by Mr. Humphreys to remind the members present to take action immediately upon returning home concerning their subscriptions to the World's Fair. He does not want you to forget to do this at once, before your enthusiasm cools off. He says it is absolutely necessary to have all the cards of subscription in within two weeks in order to determine what the Gas Industry Council wish to do in the matter—whether they will go ahead or whether they will give up the project altogether. Bear this in mind, please, and immediately upon your return attend to it. We have yet to hear from two Committees this afternoon. One of these is the Committee on Memorials, of which Mr. McIlhenny is chairman.

Mr. McIlhenny—I am very sorry, Mr. President, but I was not aware of that fact until you spoke of it now.

On motion of Mr. Humphreys the matter was left to Mr. McIlhenny.

REPORT OF COMMITTEE ON FINAL RESOLUTIONS.

The President called for the report of the Committee on Final Resolutions. Mr. Jenkins (Chairman) made the following report, which, on motion of Mr. Ramsdell, was adopted and ordered spread on the minutes:

Your Committee on Final Resolutions beg leave to report the following: The members of the Western Gas Association desire to hereby extend a hearty and unanimous vote of thanks as follows: To the Mayor of Detroit, Mr. H. S. Pingree, for kind expressions toward the gas industries in his address; to Messrs. Jerome Croul, Isaac C. Baxter, W. J. Chittenden and F. P. Byrne, of the Michigan Natural Gas Company, the Local Commmittee of Arrangements, for the many courtesies extended and excellent provisions for our pleasure and entertainment while in Detroit; and also to the Detroit Gas Light Company, the Detroit Pipe and Foundry Company, the Michigan Natural Gas Company and the Michigan Ammonia Works, for substatial backing to the local committee; to the ladies of Detroit, who have so handsomely entertained the ladies of our Association; to the press of Detroit, for very fair and impartial reports of our proceedings published in their daily papers; to the President of this meeting, for his able address, his courteous treatment of each and every member present, and his excellent management of the sessions of our Detroit meeting; and to our able and efficient Secretary, to whom, more than any one individual member, is due the success of this meeting. Respectfully submitted,

E. H. JENKINS, C. W. BLODGETT, } Committee.

The Association then adjourned.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, June 10, 1892.

Legal Fictions—Mr. Valon before the Labor Commission—The Gas Institute Meeting—A New Standard of Light.

I am afraid that foreigners and outsiders who read up English law will be considerably misled as to the nature of an English gas works. For instance, as regards the rating question they will find that a gas undertaking is supposed to be let by the year, like a house suitable for residence or business. This supposition is entirely without foundation in fact. Again, it has recently been stated in Parliament, on the authority of the Inland Revenue officers, that a sulphate of ammonia still is an apparatus that could be used for the distillation of whiskey or other potent spirit. The connection between a still for preparing potable spirits, and the boiler (often a second-hand steam boiler), saturator, scrubber and oxide pumper which usually constitutes the plant for utilizing ammoniacal liquor, is so very remote that no one outside the Inland Revenue Department would ever have discovered it, and I may safely say that if the ingredients for "the cup that cheers but does inebriate" were prepared in a boiler well saturated with tar, ammonia, and sulphur compounds, and collected in a saturator thoroughly impregnated with arsenic and other objectionable ingredients no one outside the revenue office would partake of it, and we should be made temperate by Act of Parliament, in a manner that could not but be satisfactory to those who occasionally force the virtues of temperance upon us in such an intemperate manner. The unfortunate part of a legal fiction is, that

it is not harmless like an ordinary fiction, but touches some one or other in that sensitive place known as the pocket. Gas companies already have to pay a heavy tax for a license to manufacture sulphate, but the upshot of the matter above mentioned is that an endeavor is to be made to put an additional tax upon them, as proprietors of a still. They are a law abiding people, and when they are taxed for something they do carry on, they pay up with a good grace; but when it is proposed to tax them as being able to do something they *might*, but never did and never will do, they are not inclined to submit, and the Gas Institute is going to see into the matter. Next we may expect to see the ordinary householder taxed for the possession of a kettle or a steamer. "I never made spirits with these," he would say; "No," replies the revenue officer, "but then you *could* do so, by the exercise of some ingenuity, if so inclined."

One of the most important statements on the subject of labor in gas works was that made by Mr. W. A. Valon, the President of the Gas Institute, before the Royal Commission on Labor, a few days ago. This Commission was appointed by Parliament to collect evidence on the labor question, in view of the general discontent that at present prevails amongst the laboring classes, which has within the last few years led to numerous disputes and strikes. It is not too much to say that these disagreements have had a marked and almost permanent effect upon the general trade of the country, and have at times acquired such importance as almost to lead to public panic. Mr. Valon's object was to place before the Commission reliable information as to the present state of the labor market in gas works, and his evidence is based upon data obtained from 110 different undertakings, representing nearly 3,000,000 tons of coal carbonized per annum. Roughly, this may be said to represent one-fourth of the total consumption of coal for gas making purposes in the United Kingdom, and when it is mentioned that the London Gas Company were not included, as they furnished evidence on their own account, it will be seen that a sufficiently large section has been reached to afford a fair coxteriom as to the whole. Mr. Valon deals with some 13,500 men, of whom about one-half are classified as stokers and firemen, 5,500 as yardmen and laborers, and the remainder as mechanics. Excluding exceptional cases, the laborers' wages range from 15 shillings to 24 shillings per week, and the working hours from 49½ to 60; the mechanics work a similar number of hours, and receive from 22 shillings up to 40 shillings per week; and the stokers' work time ranges from 48 up to 84 hours per week, with a rate of wages about the same as that of the mechanics. The time stated for the latter class probably represents their total attendance at the works, and includes the long intervals of rest between each charge. The time actually occupied in their arduous duties would be something like half that named. Still speaking approximately, one-half the works named pay for overtime and Sunday work at ordinary rates, and the remainder pay 1¼ or 1½ time, some few even going to higher terms. Various privileges are granted in addition, such as a free holiday once in the year, a free outing, assistance in accident or sickness, etc. In all cases there has been a considerable increase of wages within the last few years. Mr. Valon gave a great deal of evidence on the subject to customs usual in gas works with regard to sick funds, pensions, stopping on Sundays, and other points pertinent to the subject.

In considering this subject it must be remembered that not only do the hours of labor vary, but also the quantity of work done. This varies, if anything, to a greater extent than the rates of wages paid. In large works each man has a regular daily task of about the same magnitude throughout the year, but in small works there is a lot of slack time, or periods when the laborer is not worked up to his maximum capacity. In large towns the cost of house rent and living generally is much greater than in small country towns, and this also applies to different parts of the country irrespective of size of the district. Then the rates of wages paid are to a large extent regulated by those usual in the district, which vary according to the demand for labor, and are influenced by many different circumstances. It is important to remember that the man who gets the most money is not necessarily the best off.

Next week, being the second week in June, is known in gas circles as "Institute" week, because it is the season for the meeting of the Gas Institute. This will be held in London, under the Presidency of Mr. Valon, who has been known for the last 20 years or more not only as a successful gas engineer, but as a careful student of matters connected with the supply of gas. His elaborate investigations into the subject of gaseous fuel in the retort house, and the use of pure oxygen in connection with oxide and lime purification, may be instanced. The Presidential address will, therefore, be looked for with much anticipation. The papers to be presented include a Murdock lecture, by Prof. Vivian B. Lewis, besides communications dealing with a large range of subjects. It is sufficient to mention that Prof. W. Foster, Dr. L. T. Thorne, Mr. Thos. Newbigging, and Mr. W. R. Chester, are amongst the readers.

The Council have issued their annual report, which bears decisive evidence of good work on behalf of the gas industry at large. A very appropriate tribute is paid to the memory of the late Mr. W. H. Bennett, who acted as Secretary to the Institute for many years. The Birmingham medal is to be presented to the veteran Dr. Perkin, well-known as the discoverer of tar colors, which were greatly instrumental in raising coal tar from the position of a waste product, to that of a salable residual. So there can be no two opinions as to the eligibility of Dr. Perkin for that honor. The social part of the programme includes a conversazione and dance, also a day's excursion to Windsor Castle and a water trip. Altogether there is every requisite for a successful meeting. Mr. Denny Lane, of Cork, is the President-elect, so it is possible that the 1893 meeting will be held on Irish ground.

It is an open secret that before very long something in the way of a new standard of light will be brought forward, as a substitute for the much abused sperm candle. Like many other things that are not black and never are painted, the sperm candle is "not so black as it is painted," and there are many who believe that the defects urged against it might be remedied to a large extent, or that they are inseparable from any from of standard that depends upon combustion for its operation. The Harcourt pentane-air gas is evidently in favor in high quarters, but however suitable this may be for use in large towns, where the services of a skilled chemist are obtainable, it is too costly and complicated in operation for country districts. Under such circumstances the recognized standard photometer is already too intricate, and has been a source of much misunderstanding and error. If any change is made, it should be in the direction of cheapness and simplicity. Unfortunately the quality of gas cannot be weighed in the balances, or titrated from a burette. After every possible refinement in apparatus, there is the personal element to consider, and it is an open question how far personal idiosyncrasies on the one hand, or defects in apparatus and standards on the other, are concerned in the different results that are recorded from the same sample of gas. A great deal of attention has lately been devoted, in other quarters, to the subjects of color blindness and visual perception, and it is said that very few people have really perfect vision. If this is so, it follows that in experiments hinging upon personal judgment, as to the values afforded by two different lights, a diversity in results will always obtain, even if the instruments used are absolutely perfect. The great thing, after all, is not to make a gas that can be pushed through the testing room with a grand flourish of trumpets, but to supply an article that suits and pleases the public. Even if the official examiner is satisfied it does not follow that the consumers are contented, and his approbation is but a poor compensation for oil lamps swinging in nearly all the shops in the district.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. A. H. Strecker, of the Citizens Gas Light Company, Newark, N. J., writing to the JOURNAL, under date of the 16th inst., makes the following remarks anent the matter (printed in our issue for the 6th inst.), contributed by Mr. C. K. Clarke, respecting the merits of the so-called sanitary gas process:

Your issue of June 6, contains some criticisms, by Mr. C. K. Clarke, on a paper * of mine, originally read before the Society of Gas Lighting and subsequently published in the JOURNAL. Allow me to say a few words regarding this reply. The paper in question did not mention any names, and merely referred to a process which was then being exhibited at Newark, N. J. There were at that time two patent processes for making gas on exhibition in that town; but, since Mr. Clarke infers that the so-called "Sanitary Gas System" was under consideration, and comes out to its rescue, it would seem that he was rather anxious to do so and give it a little advertisement; and I trust that he feels obliged to me for affording him the chance. I am accused of being one of those who will not take the trouble to investigate a scientific subject. To this charge I demur, and submit that there is not much science about the sanitary gas process, and still less novelty. In these days every gas manager is pretty well acquainted with oil and the making of gas therefrom, and can for himself figure out the value of an apparatus as described in my sketch without help or advice from anybody. Wild statements are entirely thrown away on him. Many gas works are equipped with special retorts, which will make oil gas of as good if not better quality than those of Mr. Clarke's, and the managers of these works could, by merely adding a certain amount of air to their oil gas, produce the "sanitary" article at short notice; and without paying one cent for

* See JOURNAL, May 9, 1892, p. 672.

royalties either. Oil gas works are to be met with all over the land, and every one of them is just as much entitled to call its gas "sanitary" as Mr. Clarke his. For instance, we find, from the last report of the Massachusetts Gas Commission, that out of 43 gas companies in that State, 5 manufactured oil gas, either pure or mixed with air. To be sure they are all very small concerns, selling only a few thousand feet per day, and to the needs of which an oil gas process is perhaps better adapted than either a coal or a water gas system. In my paper I stated all the facts and results, just as I received them from the parties in charge. I did not notice any twinkle in the manager's eye when he made his statements; he seemed, on the contrary, to be quite serious about it, and undoubtedly meant to give the honest facts as he understood them. I notice what Mr. Clarke says about an analysis having been made by a competent expert. It was, however, not shown to me; neither does Mr. Clarke produce it. As to the rest of Mr. Clarke's statements I can only say that they are extremely contradictory. We see the claim set up that the gas is non-poisonous, because it contains no carbonic oxide, and that it is non-explosive because it contains no free hydrogen. Then the gentleman calmly goes on to state that I am altogether mistaken when I deny that the steam which is admitted with the air is decomposed in the retorts, and asserts distinctly that such a decomposition takes place. He ignores, however, the consequences of such a decomposition of the steam, which are the formation of certain quantities of free hydrogen, carbonic oxide and carbonic acid. In this way he does his best to knock out their pet claims with his own hands. I am, however, still of the opinion that no such decomposition takes place. It is very difficult to effect; others have tried it before (Magnus Gross, for instance) and have failed. Mr. Clarke is very much in error when he assumes that a gas is non-explosive simply because it contains no free hydrogen. It is a well known fact that the members of both the marsh gas and the olefine series (of which his gas must certainly contain over 30 per cent.) are much more explosive than hydrogen itself; that is to say, it takes a smaller percentage of these hydrocarbons to a given amount of air to produce an explosive mixture. The "sanitary" gas is, without doubt, as explosive as either coal or water gas, provided it is mixed with air in the proper ratio. On the whole, I am inclined to think that the so-called sanitary advantages of this gas, even if they exist at all, in reality are of very little practical value. Gas is made to be burned, for its light or its heat, or to be exploded for power in gas engines. But it is not intended to be inhaled. It is a valuable servant to man, when confined within bounds, just the same as fire and water; it should, however, not be trifled or fooled with, else it will do harm to its master. Coal gas contains but little CO, and is, therefore, a great deal less of an active poison than water gas; it is also somewhat less explosive. But all this has never stood in the way of its general introduction; people have taken it in preference to coal gas, when offered in competition, and the sanitary authorities have in the end always sanctioned its use. Cases of death from inhaling illuminating gas are not very frequent, except in our large cities, with their polyglot populations, and where turning on the gas has become a popular way out of this life. There are a good many gas companies in existence to-day whose gas has never killed anybody. And the sum total of damage to life and property, consequent upon explosions of illuminating gas, is so small in the long run, that it is hardly worth while to talk about it. I am pleased to find that Mr. Clarke thinks well of my calculations as to flow of gases of different densities, although he seems to doubt whether, practically, they have any bearing upon his gas. They are, however, derived from accepted formulæ, based upon natural laws and carefully conducted practical tests. The managers of the "Sanitary Gas Company" cannot get around the problem in any other way than by following the suggestions offered in my paper, either by employing larger pipes or carrying heavier pressure than necessary for ordinary gas.—ALEX. H. STRECKER.

MR. W. S. SOMERVILLE, formerly in charge at Springfield, Mo., has accepted the Superintendency of the American Gas Company's plant at Frankfort, Ind.

ABOUT a fortnight ago, during the prevalence of a severe electrical storm, lightning struck the dynamo station of the Hempstead (L. I.) gas works, causing much damage to the generating apparatus.

AT a special meeting of the town of Marblehead, Mass., held on the 15th inst., a vote was taken on the question of the desirability of accepting the Act of the Legislature (1891) enabling cities and towns of the State to manufacture and distribute gas or electricity, or both. The poll numbered 239 votes, and of these all but 8 were in favor of embarking in the municipal venture. We understand that the authorities are not great advocates of the local Gas Company, and that their move to establish a municipal plant is more in the line of taking up a gas supply than to furnish electricity. In the meantime, it is well to remember that the Marblehead Gas Company has catered faithfully, and some years without reward in the shape of dividends, to the advanced artificial lighting needs of staid old Marblehead.

THE Berlin Iron Bridge Company, of East Berlin, Conn., is putting up a new machine shop for the Solvay Process Company, at Syracuse, N. Y. The building will be 50 feet wide by 300 feet in length, and 3 stories high. The side walls will be of iron and brick (combination construction), with iron floors and iron roof, covered with the Berlin Company's patent anti-condensation roofing.

MR. GEORGE W. HARRIS, well known to the fraternity from his connection with the Allen-Harris and the Sutherland-Harris processes of gas manufacture, has obtained control of the Tarrytown and Irvington (N. Y.) Gas Light Company, and is now engaged in making important (and necessary) improvements on the plant. Through the apathy of the former proprietors, the local Electric Lighting Company—the service from which is about as indifferent as it is possible to be—managed to cut down the gas output materially; but we look to Mr. Harris and his methodical ways to speedily change the ratio.

SOME time ago we noted that the city authorities of Vincennes, Ind., made a very loud statement about the illegality of the existing contract, on public lighting account, between the city and the Citizens Gas Light Company. In fact, the authorities utterly repudiated the agreement—it has some years yet to run—the incentive no doubt to their action being a desire to put some of their friends in the way of making an honest dollar out of the sale to the city of electrical currents. The Gas Company, however, being controlled by such men as Dr. Rabb, Mr. Chambers, Mr. W. H. De Wolf and the brown-eyed Ramsdell, did not propose to wring their hands in helplessness and submit without a struggle. Not so; they put up their hands, under the rules of legal procedure, and in the end received a decision, in the final bout, before the Supreme Court of the State, on the 18th inst., affirming the perfect legality of the contract in every particular. Gas suppliers seem to have a fair chance for justice in at least two States—Iowa and Indiana.

AT a meeting of the Directors of the Cambridge (Mass.) Gas Light Company, convened for the purpose of making a suitable minute to the memory of Mr. Fordyce M. Stimson—notice of whose death was given in the JOURNAL of last week—the following resolutions were adopted:

Resolved, That the Directors consider it a duty to place on record their appreciation of the loss sustained by themselves, and by the corporation under their charge, in consequence of the decease of their associate, Mr. Fordyce M. Stimson.

Resolved, That by his faithful and judicious services for many years he earned the grateful remembrance of the stockholders whose interests he so carefully guarded, and by his courtesy he acquired the regard as well as the full confidence of his official associates.

Resolved, That the Clerk communicate a copy of these resolutions to the family of the deceased, and cause the same to be published in the Cambridge newspapers.

AMONG those who were subjected to great loss by the recent severe gales in Illinois we regretfully have to name the Galva Gas Light Company. The holders were wrecked, and other severe damage to the plant was sustained.

AT the annual meeting of the Norristown (Pa.) Gas Company the following Board of Directors was chosen: James Boyd, H. K. Weand, H. C. Crawford, Samuel S. Kohn, I. H. Brendlinger, I. W. Smith, James McGinnis, W. F. Solley, Solomon Gilbert, Albert Wetzel, Howard Boyd, P. Quillman and Geo. Hubner.

MR. ELISHA I. DENNISON, for many years a Director in the Citizens Gas Light Company, of Brooklyn, N. Y., died at his home in that city on the 14th inst. Mr. Dennison, who a quarter of a century ago was one of the noted operators on Wall street, was born at Stonington, Conn., in 1814, but resided in Brooklyn for over 50 years. Interment was made in Stonington.

"Observer" forwards the following, from Bridgeport, Conn., which he says rather goes to show that some of the residents of the Nutmeg State are

still measurably cunning, and which still further goes to show the popularity that attaches to the use of gas for purposes other than lighting—especially when the rate is "low": "An East Bridgeport man has solved the problem of cheap fuel gas; but the solution does not seem to have been permanent. The plan worked all right for a number of months, although it failed in the end. The party in question resides in The George apartment house, on William street. The house is fully up to modern ideas, and although the entrances and corridors are well lighted with gas by the owner, the tenants are expected to light their living rooms at their own expense. Several of the floors have been to let for some time, and the other day a lady who inspected the premises, with a view to leasing apartments, informed the owner that she would take the rooms provided she were allowed like privileges with the other tenants. 'Certainly,' said the landlord; 'but what especial privilege do you refer to?' 'Why,' she replied, 'one of the tenants is doing all his cooking by gas from the pipe in the hall.' The landlord then made an investigation, which resulted in his discovering that a tenant, who is a plumber, had tapped the main pipe in the hall, and led a service to his own rooms, which gave him all the gas necessary for cooking his food and heating his apartments. The landlord proposed to have the purloiner punished in the Police Court, but the plumber pleaded prettily, prevailing on the proprietor to pardon him, and accept a prompt payment of the value of the gas purloined."

IT is proposed to establish a gas works at Plattsburg, Mo., which place is the capital seat of Clinton county. It is well situated on a point on Smith's Fork of the Platte river, about 36 miles northeast of Leavenworth, Kansas, and about 29 miles east-southeast of St. Joe. It can be reached by rail direct by the Chicago, Rock Island and Pacific, and the St. Louis, Kansas City and Northern Railroads. It is quite a manufacturing place, and has a population of about 6,500.

DR. A. A. BRENEMAN, Chairman of the Committee of Arrangements, has notified us that the fifth general meeting of the American Chemical Society will be held at Rochester, N. Y., on Aug. 16.

AT the instance of Alfred P. Knight a bill was recently filed in the Circuit Court, Chicago, asking for the appointment of a receiver to wind up the affairs of the Chicago Smokeless Fuel Gas Company, which concern was incorporated October 28, 1890. It was capitalized in $10,000,000, of which Thomas G. Hall subscribed $5,000,000, Edwin L. McAuliff and Loftus E. Danely each taking $2,500,000. Complainant asserts that last October he recovered judgment against the Company for $297.50, but the sheriff failed to locate anything tangible in the shape of assets. Complainant further avers that the three millionaires named never paid their subscriptions in cash, nor by any property equivalent to the value of the subscriptions, and the Court is asked to compel them to do so.

AN echo of the gasholder wreck that occurred on the works of the Citizens Gas Light Company, in January, 1889, was heard in the Circuit Court, Brooklyn, some days ago. It was in the shape of a suit brought against the Company by Albert B. Phillips, who asked for 5 per cent. on the amount of insurance ($62,000) subsequently paid over by the insurance companies that were concerned in the loss, for services as an adjuster. He admitted that no contract existed between the Company and himself, but contended that, as the Company had accepted his services, it was bound under the common law to pay him the regular rate for such service. The Company put in the answer that it had never authorized plaintiff to act for it; on the contrary, the award was reached through the acts of regularly retained appraisers, and that Phillips was not one of those. The jury returned a verdict for plaintiff amounting to $1,112. It is likely the case will be appealed.

THE Mutual Fuel Gas Company, of Hyde Park, Chicago, will put up a new holder, on the property at 40th street,

---

ELSEWHERE we note the result of the suit entitled City of Vincennes against the Citizens Gas Light Company, and in addition thereto we submit the following main points in the decision, which was handed down by Judge Miller:

"I. When an ordinance in effect is an offer by the city and an acceptance by a gas company to furnish gas there is a contract formed which should be interpreted and considered as any other contract.

"II. When a city gives a gas company the right to use streets to lay mains it is in the nature of a license and not an exclusive grant.

"III. Every contract or ordinance in the nature of a contract does to some extent limit and control the power and authority of future Councils. This is and must be the unavoidable result of every binding contract.

"IV. A city has power to contract for a supply of gas or water beyond the tenure of office of the individual members of the Common Council making such a contract."

THE State House Construction Commission, the headquarters of which are at 27 Mount Vernon street, Boston, Mass., advertise that bids will be received "for the materials and labor required in the construction of the electric plant, including engines, dynamos and wiring, for the Massachusetts State House extension." Bids will be received until 12 o'clock, noon, of July 11, and specifications and plans can now be inspected, the same being on file at the State House Reading Room.

SPARKS from a passing train on the Erie Railroad set fire to the roof of the storage house of the Attica (N. Y.) gas plant, owned by the Loomis Brothers. The damage amounted to $500.

MESSRS. HENRY S. JACKSON and Henry R. Thompson, of Boston, have petitioned the Selectmen of Westboro, Mass., for the right to build and operate a gas works in that town. If we mistake not, Mr. Jackson was the originator and constructor of the fuel gas plant at South Framingham, Mass., which has had a fair measure of success; but not more than fair. Westboro is in Worcester county, Mass., on the Boston and Albany Railroad, at a point 12 miles east of Worcester and 32 miles west and south of Boston. It supports several manufacturing concerns and has a population of about 6,700.

THE following notice was issued last week by the Massachusetts Board of Gas and Electric Light Commissioners: "On the petition of Thomas F. Doherty and 23 others, customers of the East Boston Gas Company, asking that the price of gas furnished by that Company be reduced and the quality improved. *Ordered*, that a public hearing thereon be given at the office of the Board, 13 Beacon street, Boston, on Monday, the 27th day June, current, at 10 o'clock, A.M."

ON the afternoon of June 16th the boiler house and purifying room of the Chicopee (Mass.) Gas Company were wrecked by an explosion. No lives were lost, although Thomas Begley and Patrick Linnehan were saved in a manner that might be called almost miraculous. The damage will amount to less than $5,000.

FROM the weekly reports rendered by the Inspector (Mr. B. P. Wilson) of Gas and Illuminating Oils for Baltimore, Md., it is shown that the illuminating value of the gas supplied by the Consolidated Gas Company averages well in excess of 29 candles.

ACCORDING to the *Gas World*, the German Continental Gas Association, after an experience of five years in running dynamos by means of gas motors, reports the following tabulation of the advantages of the system: (1), small amount of space required; (2), small consumption of water—5 to 6 gallons per horse power; (3), no coal to carry—independent of railroads; (4), no smoke; (5), no explosions; (6), cheaper than steam engines in respect of (1) ground required; (2) relative convenience of gas motors rather than steam engines in a town, whence greater choice of place within a town and smaller distances to lay cables; (3) gas motors above 10-horse power being cheaper than steam engines, boilers, chimneys, etc.; (7), less loss of electricity, because station more favorably situated; (8), less attendance and wages; (9), exact control over fuel; (10), more regular working and greater security of power to meet unforeseen demands; (11), cost of fuel can be returned (the gas company running the electric station) at the full cost price of the gas supply. Gas motors now cost but one-half the cost of steam engines, and in the future the price of the larger sizes of gas motors will be reduced.

ATTENTION is called to the fact that Mr. Cyrus Borgner has succeeded to the business of the old firm of Borgner & O'Brien, dealers at Philadelphia in firebrick and clay retorts. Mr. Borgner's headquarters are at 23d street, above Race street.

THE Hon. M. H. Arnot, on turning over the Elmira (N. Y.) gas and electric light plants to the capitalists now in control of the same, presented substantial sums of money to his former employees. The largess ranged between $400 and $100, according to the length of time the recipient was in Mr. Arnot's employ.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, JUNE 27, 1892.

The Market for Gas Securities.

The market for city gas shares shows no marked change over that of last week, strength being the prominent feature, notably so in the case of Mutual, which is freely bid for at 140. Equitable holds its own, and is much inquired after, even at the high prices made in it a fortnight ago. The Directors have declared a regular quarterly dividend of 2 per cent. on the shares, payable July 15th. Consolidated also manifested much strength, the opening price today (Friday) being made at 115¼. The stock is cheap at the rate.

Over in Brooklyn, gas shares are steady, dull and strong. Metropolitan is 114 bid ex-dividend, and this seems to be a pretty good figure for it. There is nothing particularly new in the situation, the contending parties evidently preferring to dangle their legs over the top fence rail for a while, rather than to meet each other on terra firma. The East River scheme is still in the tunnel stage. The Directors chosen by the Fulton-Municipal Company are: Benj. Brewster, H. H. Rogers, Wm. Rockefeller, H. R. Bishop, Jas. Jourdan, E. C. Benedict and W. H. Curtiss. Chicago gas is steady and strong, while Consolidated, of Baltimore, remains as before. The situation at large is all in favor of investors.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

June 27.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	115½	115¾
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	153	155
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	140	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	40	45
Preferred	5,000,000	100	91	93
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	140
Citizens	1,200,000	20	113½	113½
" S. F. Bonds	320,000	1000	—	103
Fulton Municipal	3,000,000	100	—	140
" Bonds	300,000		102	—
Peoples	1,000,000	10	—	92½
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	—	120
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	145	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	—	130
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	90	90¾
2d " " "	3,000,000	1000	77	78
Bay State Gas Co.—				
Stock	5,000,000	50	60¼	60½
Income Bonds	2,000,000	1000	6	8
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	81⅞	82
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	90⅛	90⅞
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	102	—
2d "	2,500,000	1000	101½	—
Consumers Gas Light Co., Jersey City	2,000,000	100	20	—
Bonds	600,000	1000	80	—
Cincinnati G. & C. Co.	7,000,000	100	—	200
Consumers Toronto	1,000,000	50	180	185
Central, S. F., Cal			90	—
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	—	55
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	180	200

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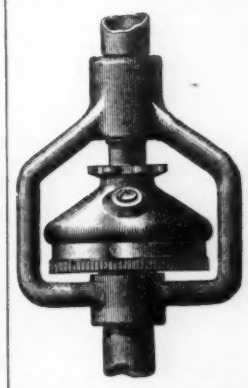

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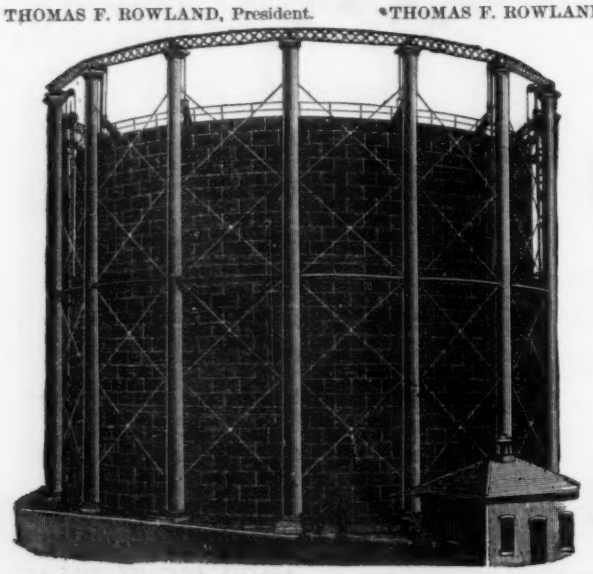

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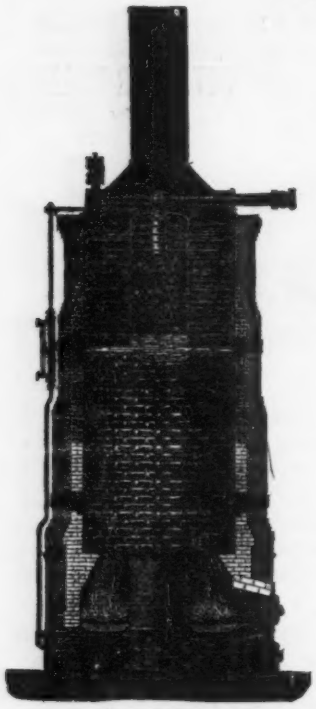

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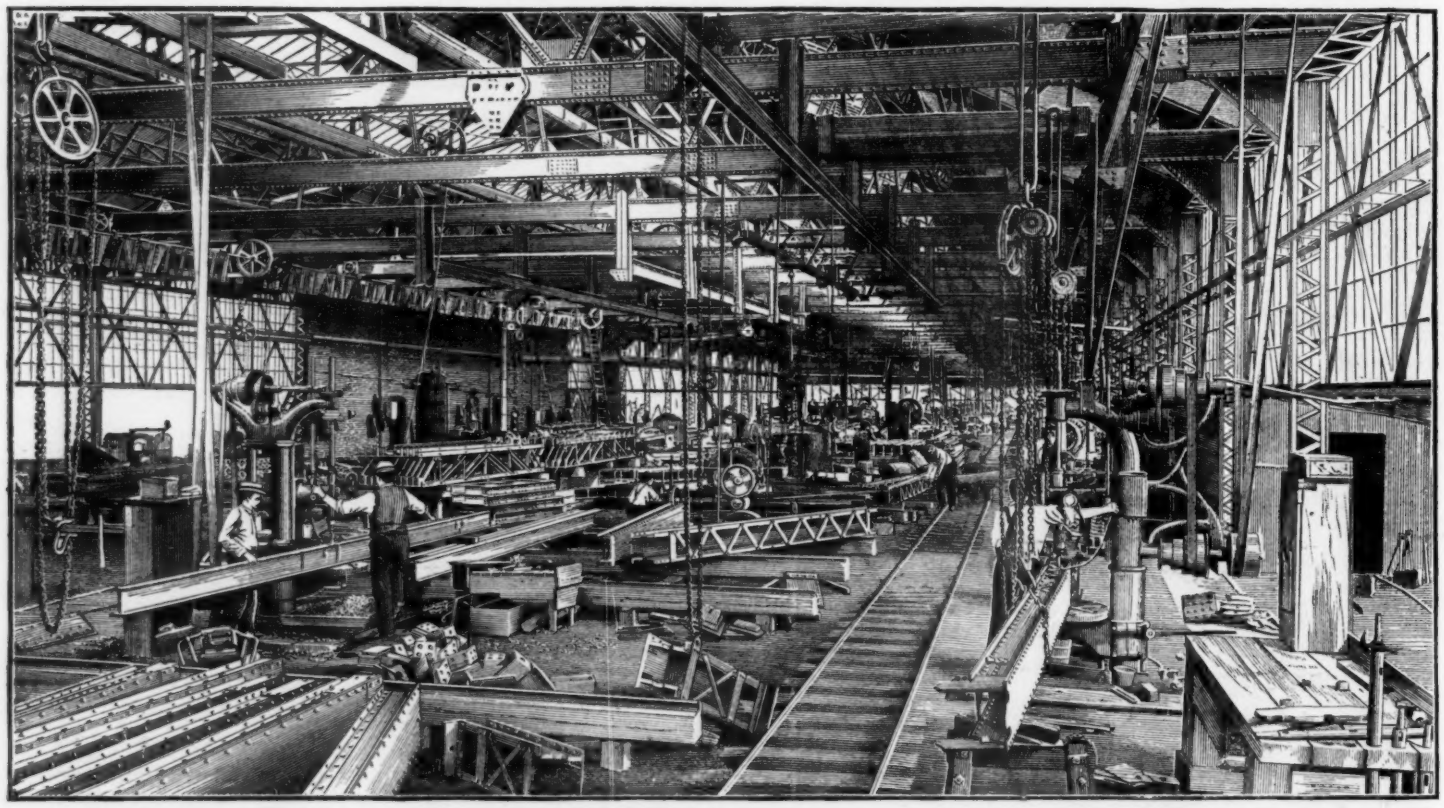

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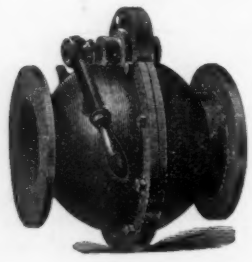

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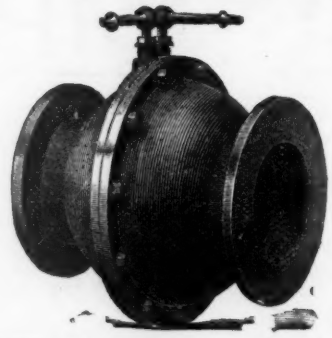

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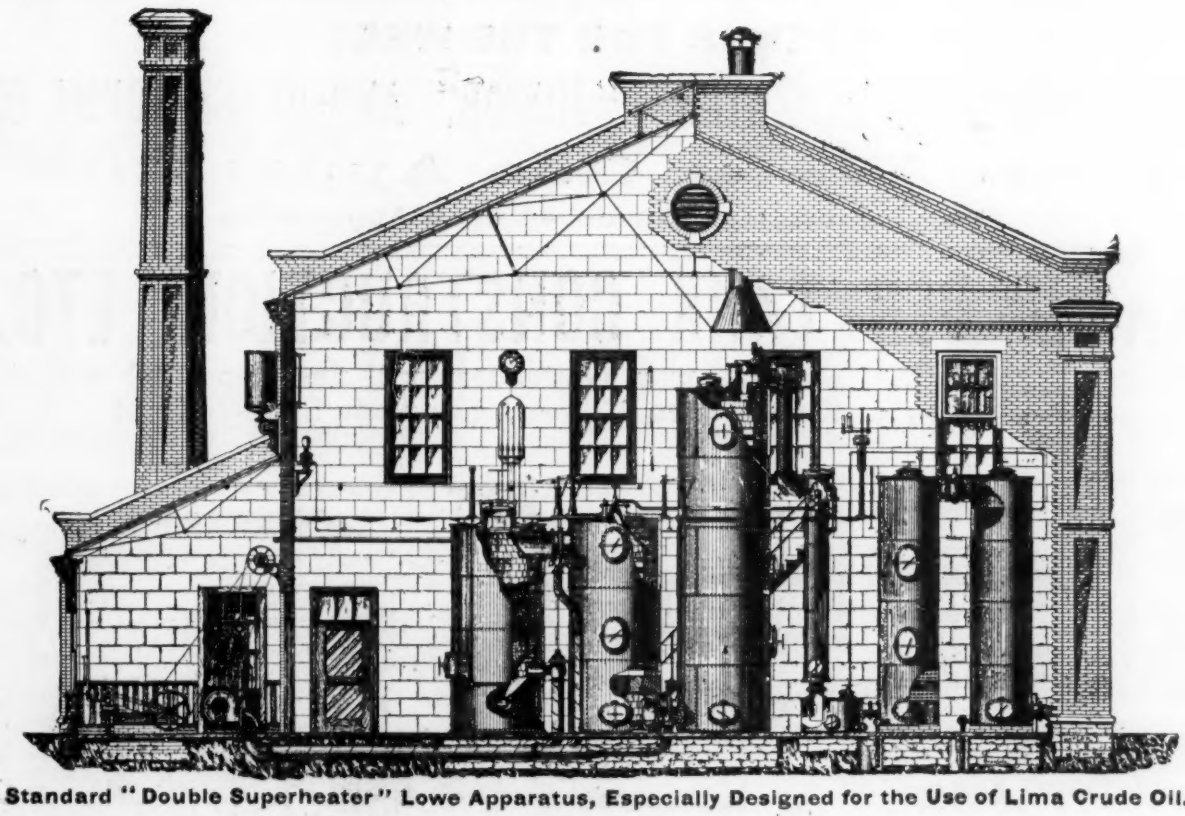

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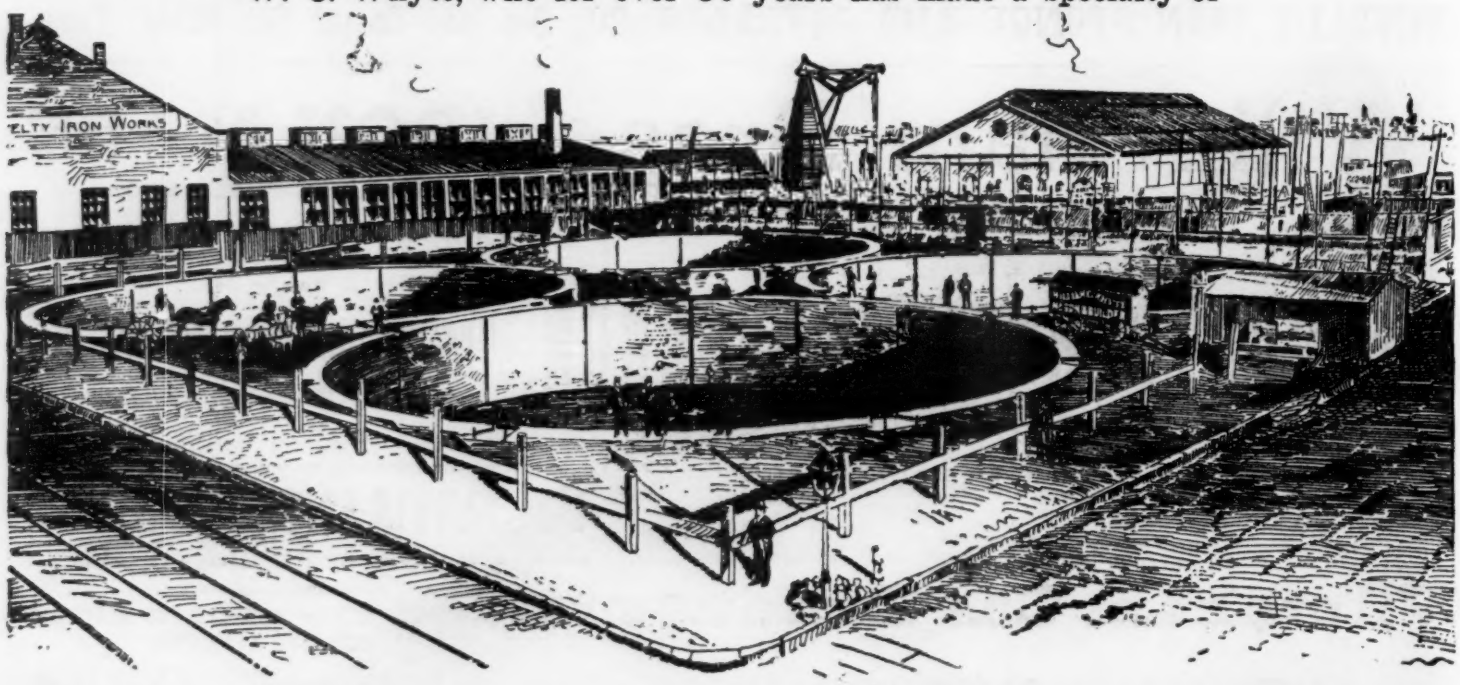

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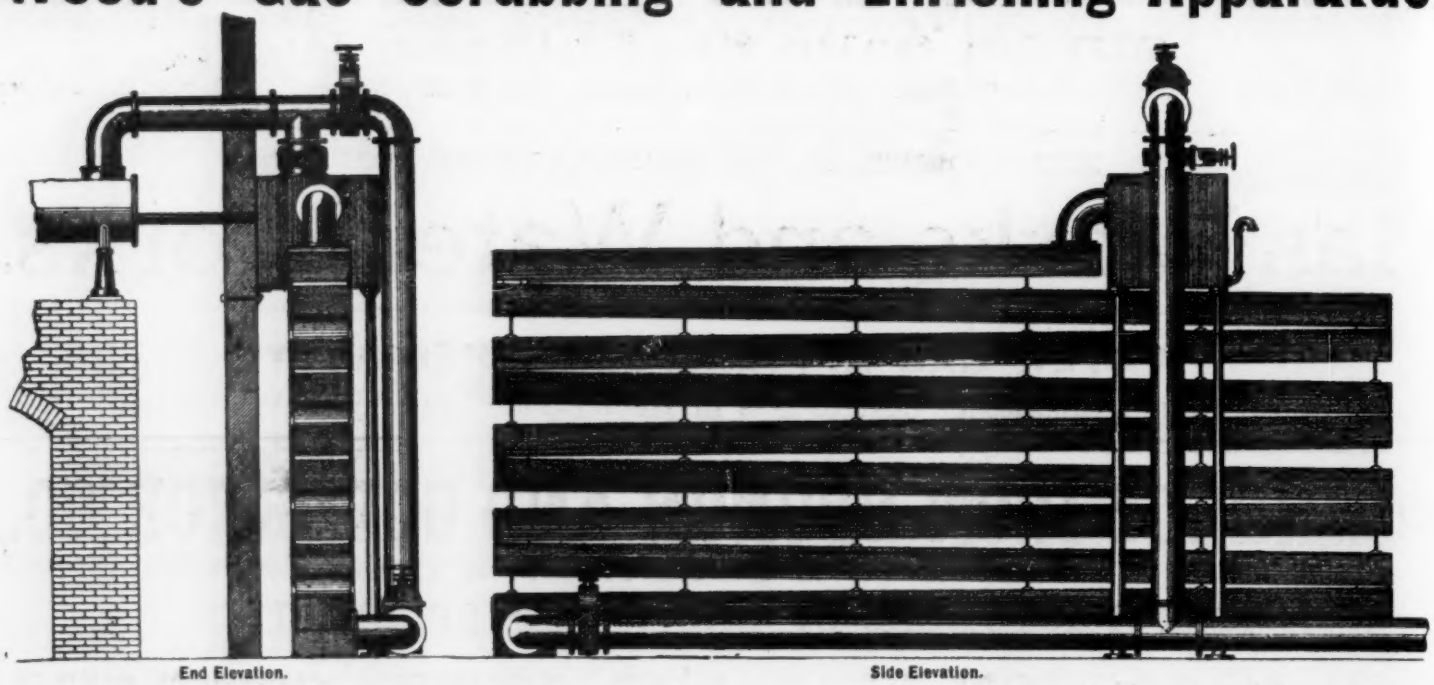

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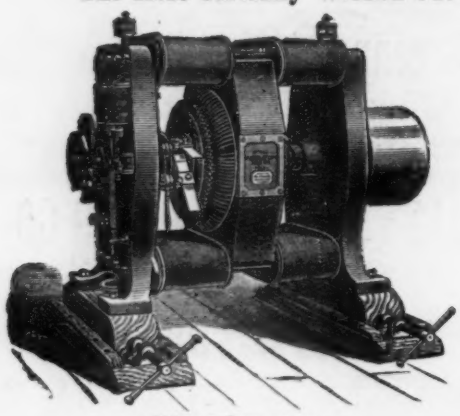

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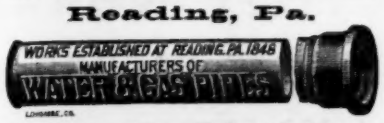

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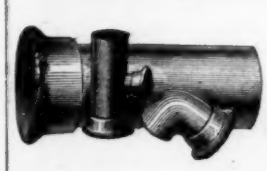

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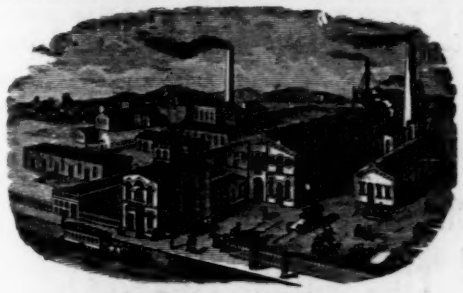

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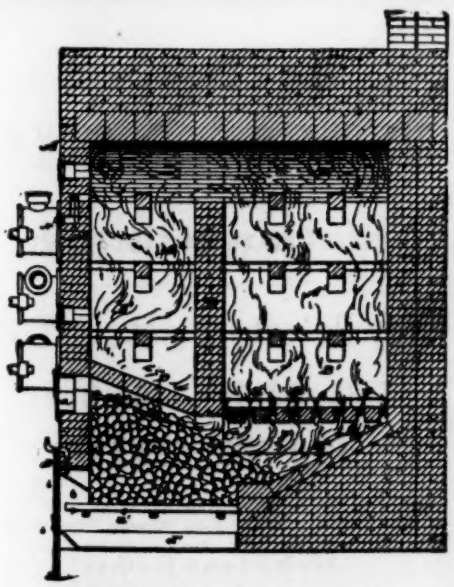

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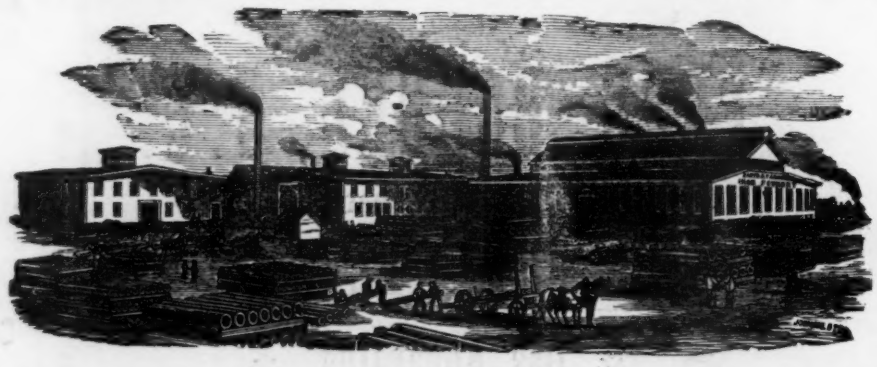

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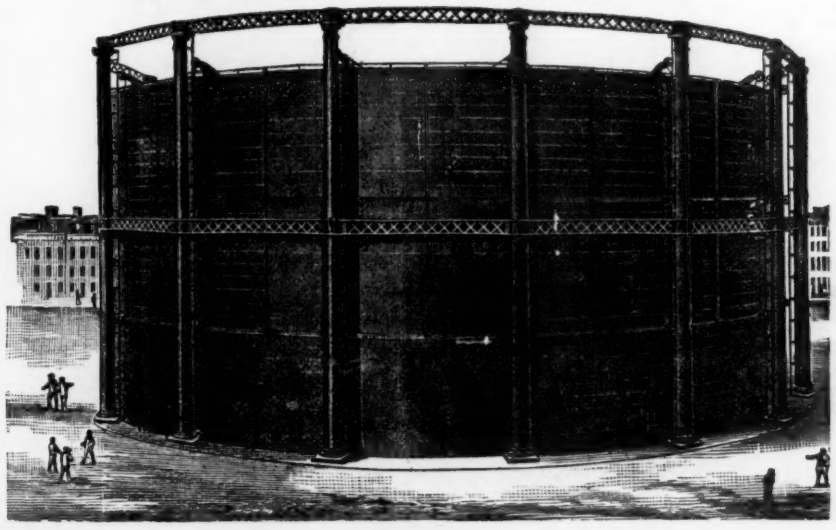

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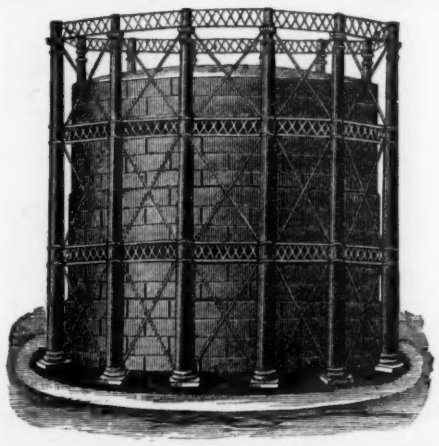

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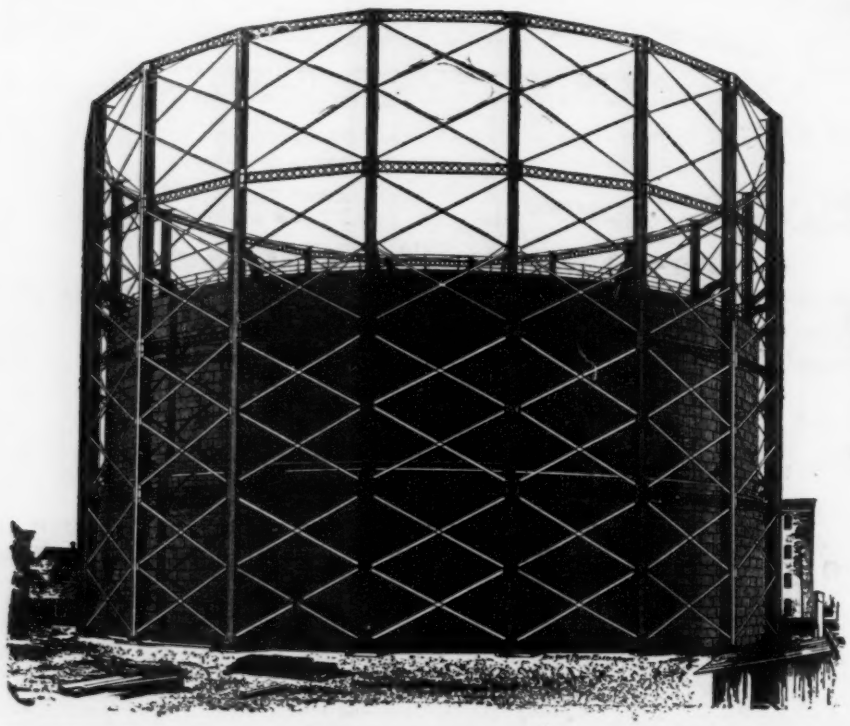

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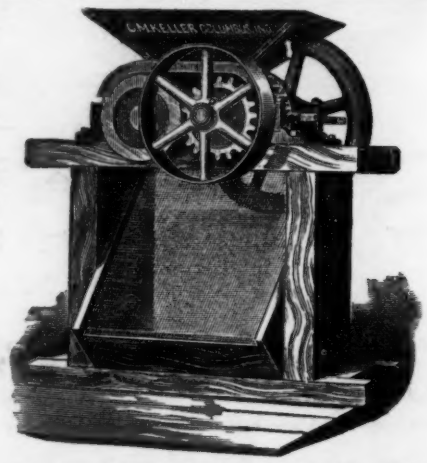

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STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS & PRESSURE GAUGES.

Meters of all makers Thoroughly Repaired.

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DRY GAS METERS.
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(Using Poppet Valve and Hot Tube instead of Slide Valve.)

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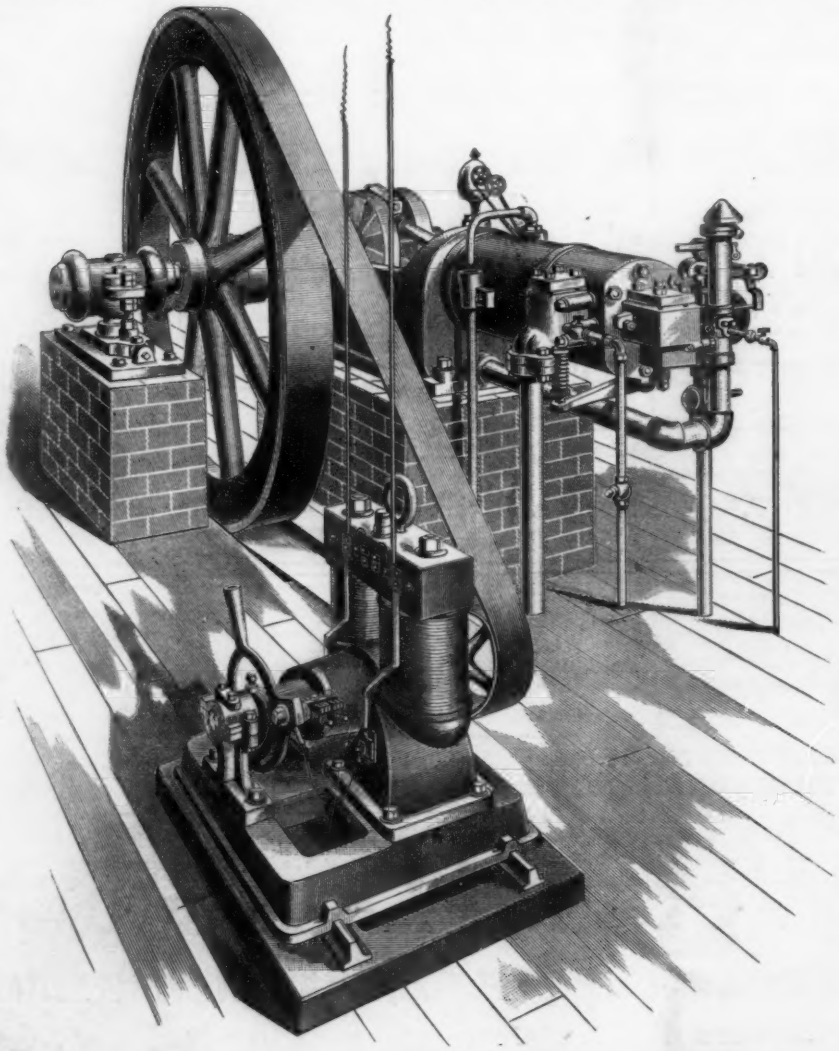

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